

From the Department of Clinical Neuroscience,
Division of Insurance Medicine,
Karolinska Institutet, Stockholm, Sweden

WORKPLACE-BASED SICK LEAVE PREVENTION AND RETURN TO WORK

Exploratory Studies

Randi Wågø Aas



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*In memory of my dear father Kåre Aas,
who taught me to meet demanding tasks
with hard work.*

ABSTRACT

Background: Earlier research has revealed risk factors for sick leave in the workplace, and thus the workplace has become an important arena for sick leave prevention and return to work (RTW). Despite that, some of these aspects have received little attention in exploratory studies. Simultaneously, there is a need to translate and implement the growing knowledge base in this field in order to develop evidence-based practice (EBP).

Aim: The aim of the present research was to explore some aspects of workplace-based sick leave prevention and RTW, such as workplace interventions (studies III, IV, and the appendix), leadership qualities (study I), and work demands (study II), and also to reveal challenges to translating scientific knowledge into intervention decisions in the RTW process, and possible solutions to these challenges (study III).

Material and methods: Content analysis methods were applied on data from interview transcripts and documents. In addition, a Cochrane systematic review of the literature was conducted.

Results: *Study I* identified 78 distinct leadership qualities and seven leadership types ($n = 345$ meaning units) perceived by 30 employees on long-term sick leave and their immediate supervisors. The three most valued leadership qualities were “ability to make contact”, “being considerate”, and “being understanding”. The three most valued leadership types were the Protector, the Problem-Solver, and the Contact-Maker. The subordinates gave more descriptions of the Encourager and the Recognizer, whereas the supervisors most often described the Responsibility-Maker and the Problem-Solver. The combination of leadership types reported most frequently was the Protector together with the Problem-Solver.

In study II, eight employees on long-term sick leave due to musculoskeletal diseases and disorders described 51 work demands they had experienced. The demands were perceived in some cases as having only a negative or a positive impact on work performance, but in others as both. Only seven of the demands were physical in nature, and most involved emotional and cognitive challenges in mastering the work tasks. It was also experienced that most demands came from the employee ($n = 36$) and only a few from the employer/work environment ($n = 7$) or both those sources ($n = 8$).

Study III was a hypothetical case study aimed at revealing the challenges associated with translating scientific evidence into intervention decisions in the RTW process. This investigation was performed according to EBP frameworks. The evidence seemed to differ depending on whether it came from preventive, curative, or rehabilitative interventions. Moreover, it appeared that evidence in some cases originated from “good-for-all” interventions but in others from “tailored-type” interventions. Thus, a need to differentiate the roles of evidence was revealed in terms of whether it inspired, challenged, enlightened, informed, or determined the intervention decision. In general, the evidence-based framework seemed to construct a confined decision process. Possible solutions, and revised EBP steps were suggested.

In study IV, 15 workplace interventions were identified ($n = 306$ meaning units), which were intended to reduce sick leave rates in 12 municipalities. The interventions were divided into two groups according to their targets in the organizations: nine organizational-workplace interventions targeted structures, processes, and culture ($n = 220$ descriptions, 72%); six employee-workplace interventions targeted persons ($n = 86$ descriptions, 28%). Examples of organizational-workplace interventions were developing routines/systems, establishing cooperation/ collaboration, providing information/education, building culture/anchoring, and recruiting/staffing. Employee-workplace interventions involved well-being/lifestyle interventions, physical activity/exercise, redeployment, adaptation, follow-up of employees on sick leave, and RTW programmes. The intervention profiles varied considerably between the municipalities.

*In the appendix (study V), a Cochrane systematic review of the literature was conducted to reveal the content and effectiveness of workplace interventions for employees with neck pain. Of 1,995 references found, 10 randomized controlled trials (RCTs) were included. Two of the RCTs had low risk of bias, and eight of them examined office workers. Few were on sick leave. Only three of the ten studies assessed the outcome of sick leave. The workplace interventions varied considerably regarding complexity and content. Overall, evidence was of low quality and showed no significant impact of workplace interventions on *pain reduction* (seven RCTs, 2,368 workers). Furthermore, one RCT, with 415 workers revealed that workplace interventions were significantly more effective in *reducing sick leave* in the intermediate term (OR 0.56, 95% CI 0.33–0.95), but not in the short or the long term.*

Conclusions: The results reported in this thesis revealed a variety of terminology related to workplace interventions, leadership qualities, and work demands, which might contribute to more in-depth understanding of sick leave prevention and RTW at workplaces. It was a challenge to trying to use evidence from randomized controlled trials in the RTW process, and the results call for new EBP approaches to translate evidence into decisions concerning complex workplace interventions. The current research also revealed that knowledge about the effectiveness of workplace interventions is still limited.

Key words: sick leave, sickness absence, return to work, workplace interventions, work demands, disability prevention, evidence-based practice, knowledge translation, implementation science, occupational rehabilitation, Rogaland RTW study.

LIST OF PUBLICATIONS

This thesis is based on the following studies, which are referred to in the text by their Roman numerals:

- I. Aas RW, Ellingsen KL, Lindøe P, Möller A. Leadership qualities in the return to work process: A content analysis. *Journal of Occupational Rehabilitation*; 2008,18:335-346.

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- II. Aas RW Thingbø C, Holte KA, Lie K, Lode IA. On long-term sick leave due to musculoskeletal diseases and disorders. Experiences of work demands. *Work. A Journal of Prevention, Assessment and Rehabilitation*. In press 2011.

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- III. Aas RW, Alexanderson K. Challenging evidence-based decision making. A hypothetical case study about return to work. *Occupational Therapy International*. In press 2011.

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- IV. Aas RW, Möller A, Loisel P, Alexanderson K. A governmental initiated programme to reduce sick leave in Norway: Identifying the workplace interventions. Submitted 2011.
- Appendix (V) Aas RW, Tuntland H, Holte KA, Røe C, Lund T, Marklund S, Möller A. Workplace interventions for neck pain in workers. *Cochrane Database of Systematic Reviews*. 2011, Issue 4, Art. No. CD008160. DOI:10.1002/14651858.CD008160.pub2.

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LIST OF ABBREVIATIONS

CI	confidence interval
EBP	evidence-based practice
ICD-10	WHO's International Statistical Classification of Diseases and Related Health Problems. Tenth revision.
ICF	WHO's International Classification of Functioning, Disability, and Health
MD	mean difference
OR	odds ratio
PICO	PICO stands for patient, intervention, co-intervention, and outcome
RCT	randomized controlled trial
RTW	return to work
WHO	World Health Organization
WI	workplace intervention

PREFACE

I first met the field of occupational health more than 20 years ago, at which time I was in the middle of my bachelor's education in occupational therapy. It was challenging to learn about the efforts that companies were making to identify and remove risk factors for health problems in the work environment. I remember thinking that this field would be my future speciality. The data for my bachelor's thesis was collected in occupational health services in Copenhagen in 1990, and this included visits to actual workplaces, which made a strong impression on me. We went to a brewery and a telecom company to observe how the employees performed their work in a real context and how adjustments were made to prevent health consequences. At that time the focus was not on preventing sick leave and promoting return to work (RTW), but rather on disease prevention.

After working in a paediatric clinic and in public health care for five years, my interest in workplace-based issues again entered my thoughts. Therefore, I started the company Ergokompetanse, providing occupational health advises at worksites. During this period, I increasingly asked those I met in workplaces about employees who were on sick leave; I did not see them, and they were seldom mentioned. In the late 1990s, I also became interested in evidence-based practice (EBP) and started to provide courses on this topic for health care personnel. Documentation of effectiveness of interventions was a challenging task. At the same time, my engagement in the World Health Organization (WHO) classification of functioning (then called ICIDH, redesignated ICF in 2001) became more extensive, and I joined the national reference group in the Directorate of Health in 2003. My master's thesis in health sciences at the University of Oslo in 2002 focused on describing the functioning of a patient group by using ICF terminology. As a researcher, I gradually saw new potential in applying this terminology, particularly to help describe and clarify what the sick leave and RTW interventions were targeting, that is, what they tried to solve.

My concern slowly grew about whether all disease-preventing interventions implemented at workplaces were actually providing results, and whether these efforts had an impact on sick leave and RTW. I more often questioned whether the same measures used in disease prevention, also were useful for sick leave prevention. Furthermore, I experienced that sick leave was the only "intervention" being used, even though it did not seem to solve the employees' problems. The articles published by Patrick Loisel and colleagues at Sherbrook University in Canada gave me new perspectives on an aspect of this field that those investigators called a paradigm shift from disease prevention to disability prevention. While working to improve the effectiveness of workplace interventions, I also wondered if our intervention research was really able to capture the complex features of the workplace that are relevant to sick leave prevention and RTW. In addition, I became more concerned about whether the courses I held in EBP were indeed helping to put science into practice. My enthusiasm was awakened when I discovered the literature describing knowledge translation and implementation science, and more importantly, this discovery led to the establishment of PreSenter, a new research and knowledge translation centre focused on sick leave, inclusion, and RTW.

When I participated in a PhD course on sickness absence research at Karolinska Institutet, I came in contact with a research environment that was conducive to learning and understanding more about the complex phenomenon of sick leave. This also gave me the opportunity to become familiar with applying the categories of studies on sickness absence suggested by the Swedish Council on Technology Assessment in Health Care (SBU) [1]. In Table 1, these categories are used to present an overview of the topics included in my thesis.

Table 1. Categories for studies of sickness absence

Focus of the study	Scientific discipline	Perspective taken	Structural level of the factors included in the empirical analyses
- Risk factors for sickness absence	Medicine Health Sciences	Society Local society	Individual Family
- Factors affecting return to work	Sociology	Insurance	Workplace
-Consequences of being on sick leave	Psychology	Health services	Organization
- Sickness certification practice	Economics	Physicians	Community
	Law	Employers	National
	Public health	Sickness absentees	International
	History		
	Philosophy		
	Management		
	Anthropology		

Note: The categories most relevant to the subject of this thesis are indicated in bold type.

I feel that one of the current challenges in this research field is that we do not know what interventions are being applied at workplaces. I believe this calls for “black box research”, such as exploratory inductive investigations. By exploring the experiences of different types of actors and stakeholders, we might gain new in-depth knowledge on what really happens at workplaces. For instance, the variability in workplace interventions might concern the content, the provision, the progress, the dose, the actors, the competence of the provider, and the contextual factors related to the type of measures used, but it might also be associated with how the interventions are implemented in new contexts. In order to be able to design workplace interventions that are more targeted and precise, the main objective of my research has been to explore workplace aspects in greater detail. It is possible that more focused workplace-based efforts made in the future will contribute to prevention of sick leave and to more sustainable RTW, and thereby lower the costs of sickness absence and the burdens on employees, employers, and society as a whole.

Personally, I feel it is exciting that the issues of *sick leave*, *RTW*, *workplace interventions*, *EBP*, *intervention research*, *knowledge translation*, and the *ICF* have followed me for over two decades, and that they have more or less been incidentally unified in this thesis. Still, I believe that these issues will also induce me to struggle with new questions and concerns for the future.

1 BACKGROUND

1.1 SOCIETAL AND POLITICAL CONTEXT

To understand measures to prevent unnecessary sick leave (from here on called sick-leave prevention) and promote return to work (RTW), it is essential to contextualize these phenomena. Generally speaking, several contextual factors are important when attempting to understand sick leave in a society. The employment rate in Norway is the highest in Europe, on average 10% above than the mean level in the countries of the European Union [2]. One reasons for this is the large number of women in gainful employment in Norway, representing a level 13% higher than the mean rate in the European Union. Furthermore, both younger (ages 15–24 years) and older (ages 55–64 years) people in Norway participated in the labour market to a greater extent than seen on average in other European countries. The picture is essentially the same in Denmark and Sweden [2].

The way that sick leave is viewed and solved in a given society can also be explained from a historical viewpoint. The given empirical context for this thesis is Norway, and hence the text presents the historical background of the prevention of sick leave and promotion of RTW at workplaces in this country. Here, these are divided into three epochs, which I have chosen to call the *initial era* before 1989, the *working-line era* of the 1990s, and the *inclusive working life era* of the 2000s.

1.1.1 The initial era before 1989

As early as 1911, the first law concerning sickness benefits for employees with the lowest income was enacted in Norway [3]. In 1974 the sickness benefit system was integrated into the National Social Insurance (Folketrygden), and in 1978 the current benefit system with full compensation for people on sick leave was added [3]. A growing tendency towards more people being on long-term sick leave and disability pension had already emerged in the 1980s. This fact became important for what happened in the 1990s, when a parliamentary resolution adopted in 1988 strengthened the follow-up of people on long-term sick leave (> 8 weeks) [4]. Two different initiatives were introduced: (1) what are known as the basic groups in all municipalities, which were to try to find possible interventions to get people back to work more quickly after sick leave; (2) a new medical certificate for sick leave lasting longer than eight weeks.

1.1.2 The working-line era of 1990–1999

In Norway, what is known as the “working line” was strengthened in the 1990s. Both the disability [5] and sick leave [4] benefit systems were investigated on a national level to ascertain why the costs of sick leave and disability had increased, and to find a way to reduce the expenditures in that context. One proposal was to give the employers more responsibility for performing workplace assessments of employees with prolonged or frequent periods of sick leave [4]. In 1991, the employers’ organization NHO and the union LO started a three-year project in some sectors of industry that was aimed at reducing sick leave rates in the 400 participating companies. The evaluation

report revealed a 15% reduction in sick leave over the whole period [6]. Another study in this project revealed that three types of workplace efforts contributed to prevention of sick leave and lowering of sick leave rates: developing the working environment, providing good routines for early detection of those in risk of being sick listed, and having high quality follow-up of employees taking sick leave [7-9]. The project also showed that, within the participating companies, there were obstacles to uncovering sickness among the employees and to bringing those on sick leave back to work [8]. Two years later, the success of this two-party sick leave project was also stressed in the White Paper on Welfare [10]. The cooperation between the employee and employer organizations was considered to be particularly valuable, and the government wanted to use this model as a basis for their policy and also spread the results to other branches, especially the public services.

In 1994 a large experimental programme was initiated by the Social and Health Ministry [11] and carried out by the National Social Security Office (Rikstrygdeverket). The aim was to try new workplace interventions that were intended to prevent and reduce sick leave. In the evaluation of this programme in 2000, the projects that had focused on the follow-up of sick leave could be sorted into three models, which were referred to as “the company model”, “social insurance model I”, and “social insurance model II”. In the first model, the employer did everything possible to find interventions for employees on sick leave before contacting the social insurance office. In the other two models, the social insurance office was in charge of the process of bringing the employees back to work. The differences between social insurance models I and II were related to the level of contact with the workplace. These two models were considered most beneficial, because the actors experienced that they obtained better understanding of a sick leave case when they visited the workplace [11].

1.1.3 The inclusive working life era from 2000 onward

At the Lisbon meeting in 2000, the European Union Presidency agreed on a new strategy for employment in Europe involving introduction of a knowledge-based economy [12]. A central point in this strategy was the goal to strengthen the labour market within the Union: “*to regain the conditions for full employment*” [p. 2]. The goal of participation in the labour market was set to increase from 61% (in 2000) to 70% (in 2010). This was to be achieved in particular by establishing a flexible labour market with equal opportunities for all.

The same strategy was pursued in Norway within the Inclusive Working Life Agreement established in 2001 [13], which concurs with the Nordic welfare model [14]. This agreement was signed by the employer confederations and labour unions, as well as the government. The aim was to reduce the sick leave rates by 20%, to include more persons with disabilities, and to raise the retirement age. It could be claimed that a paradigm shift occurred in Norway regarding how follow-up of employees on sick leave should be conducted. The overall responsibility for handling sick leave was transferred from public authorities and health care to the employer [15] by use of arguments from the international trend of Corporate Social Responsibility [16]. This resulted in three changes on a national level: (1) the workplace became the main arena for both prevention of sick leave and rehabilitation of persons on sick leave; (2) the

employer and the employee became the core actors in finding interventions, and the other actors took on a support function and were called “the good helpers”; (3) a new ideology was implemented in which the focus was shifted from disease and problems to functioning and resources [11]. Today, there are as many as 49 different Inclusive Working Life interventions to prevent sick leave and promote RTW [17].

The tripartite agreement was also implemented on a local level, where all willing companies signed an Inclusive Working Life Agreement involving the employer, a local employee representative, and the social insurance office. Figures from the National Social Insurance show that approximately 1.2 million employees (i.e., more than half the workforce) were working at Inclusive Working Life companies (n = 44,000) in 2010 (www.nav.no). About 88–97% of public employees work at such companies, whereas the rate is only 15–20% (average 35%) in some branches of the private sector. One competence environment called a Working Life Centre was founded in each county included in the social insurance organisation. Becoming a Working Life company entailed several advantages, including economic aid and access to a contact person (advisor) from the Working Life Centre who could offer guidance in how to reduce sick leave. Evaluation showed that the companies were satisfied with the contact person and the help they received from the Working Life Centres [17-21].

In 2004, the role of the general practitioner (GP) was highlighted in an educational programme offered to all GPs. Almost half of the GPs participated [21]. The objective of the programme was to strengthen the supervisory role of GPs in relation to the workplace and the social insurance offices. A new sickness certificate was also developed, on which the GPs were to include a short report on the functioning of the person on sick leave. This initiative was also intended to promote the workplace as the main arena.

The Inclusive Working Life Agreement adopted in Norway in 2001 [22] heralded a new way of following up employees on sick leave. It meant that employers were to be responsible for that task, and workplaces were defined as the main arena for preventing sickness absence and promoting RTW. The employee on sick leave and his/her immediate supervisor became the core players, while the health care service and social insurance office¹ were to support those actors by being “good helpers”. This change in Norway corresponds to international trends, which have been communicated mainly through Corporate Social Responsibility [23] and Disability Management [24-29]. Notwithstanding, even today, ten years after inception of the Inclusive Working Life Agreement, there is only limited scientific knowledge about how to achieve sustainable RTW. Despite this, the impact of workplace aspects on prevention of unnecessary sick leave and RTW is seldom questioned [30-34].

The Sick Leave Committee led by Prime Minister Stoltenberg was established in 2006, with a mandate to propose and implement interventions aimed at reducing public expenditures related to sickness absence. The work done by this committee [35] resulted in a renewed system for follow-up of people on sick leave, including dialogue meetings, clarified roles of actors and intervention plans, more adaptations at

¹The Norwegian Labour and Welfare Administration is called NAV.

workplaces, and stronger employer commitments. However, the most costly intervention was to strengthen the treatment and rehabilitation of persons who are off sick, and hence the programme entitled “A Fast Return” (Raskere Tilbake) was born [36]. The goal of this initiative was to accomplish more rapid clarification, medical treatment, and rehabilitation in sick leave cases, circumventing the ordinary queues and budgets.

1.2 THE WORKPLACE

The workplace is the focus of this thesis. However, many different contexts are involved in the daily lives of individuals, and thus these might also play roles. In addition, it might be of interest to investigate research results regarding the impact of workplaces on sick leave prevention and promotion of RTW in order to enable evidence-based practice (EBP) and knowledge translation in this field. These topics are given further consideration in this chapter.

1.2.1 The workplace as the main arena

As mentioned, several premises have made the workplace a more focused arena for interventions. The responsibility for health and sick leave has gradually been transferred from the healthcare system to the employer. This has also been expressed through the model of Corporate Social Responsibilities, which, among other things, targets companies’ responsibilities for their own employees’ health and absence. Accordingly, new social policies and systems highlight a more spacious or inclusive working life [22], which anticipates involvement of the stakeholders and closer contact between the employees and employers [37]. An implication of this is that the workplace is a core intervention arena in Western health and social policy, and this development has been further expanded by promotion of the Disability Management movement [26]. Still, this arena needs to be seen viewed in relation to other contributing arenas. For example, contact between health care providers and the workplace actors has been looked upon as essential for RTW [38].

Several official documents in Norway have emphasized the importance of the workplace as the main arena for both prevention of and rehabilitation after sick leave. This is exemplified by the following [11]: “*The starting point is that interventions to reduce sick leave should be anchored at the workplace. This is true both for prevention of sick leave and the follow-up of sick listed employees.[...] The workplace is the central arena for prevention*” [p. 142]. Another core official political document [39] included this statement: “*The workplace and working life are the most important arena for the inclusive working life politics. Interventions to prevent and to limit exclusion from the working life, and to promote inclusion should thereby as often as possible happen at and in connection to the workplace.*” [p. 171], and also “*Several of the main actions need to be seen in line with the cooperation between the government and working life actors for a more inclusive working life, where the basis is that the most important arena for inclusion is the workplace.*” [p. 169]. Thus, in Norway, the main arena for preventing sick leave and promoting RTW is according to legislation, the workplace.

The arenas consisting of employees' RTW after sick leave might be defined as comprising one main arena, two side arenas, and three life arenas (see Figure 1)[40]. The two side arenas are suggested to be the *health care* and the *social insurance office*, and the three life arenas might be *home*, *leisure*, and *society*. It is seldom possible to understand the problem of sick leave by focusing solely on one arena. Indeed, it is often necessary to see them simultaneously and in relation to each other. In addition, both the social insurance offices and health care services involve actors that are in the workplace providing several types of interventions for RTW. Examples of this are visits to worksites, workplace assessments, introducing adaptations, giving advice, and providing economic support for changes.

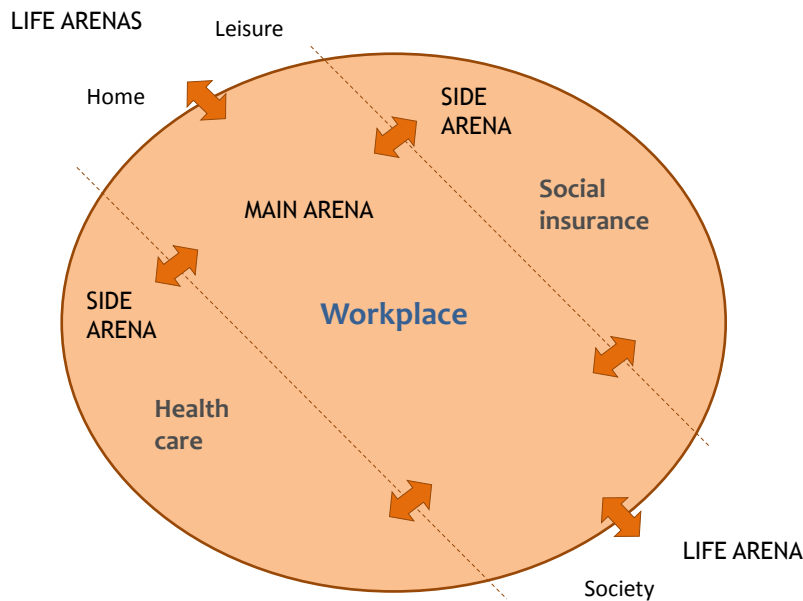


Figure 1. Main arena, side arenas, and life arenas for preventing unnecessary sick leave and promoting return to work

1.2.2 The workplace in the scientific literature

The scientific literature has also strengthened the emphasis on the workplace/worksite, or it has at least shown greater use of these terms, as illustrated by a search of the Medline database from 1980 onward. During the first twenty years of that period (1980–2000), an average of 0.7 more articles per year used the term *workplace* or *worksite* in the title, abstract, or key words, and that was raised to an average of 9.8 more articles per year after 2000. The top year of 2006, when 84 articles used *workplace/worksite*, might be regarded as promising for the scientific knowledge base on workplace-related sick leave efforts.

If the number of articles using the term *absenteeism* or *sick leave* increases, it seems natural that the number of articles mentioning *workplace/worksite* will also rise. Figure 2 takes this into account and gives the percent of the articles mentioning workplace/worksite in their title, abstract, or key words among all the articles coded with the MeSH terms *absenteeism* and *sick leave*. In 1980, only 1% of the articles mentioned *workplace/worksite*, whereas 17.6% did so in 2006. The diagram shows a steady increase since 1990, with *workplace/worksite* used four times more often in 2006 than in 1990, and more than twice as often in 2000 compared to 2006. This growth of the literature in this area might provide new possibilities to apply EBP in promoting return to the workplace among employees on sick leave.

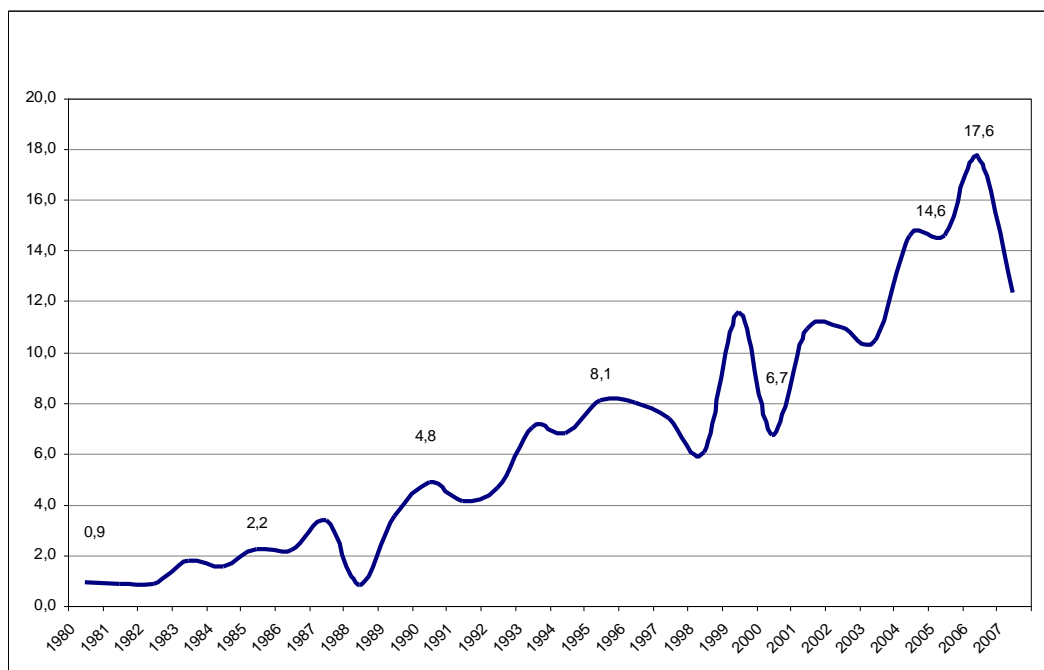


Figure 2. Percent of articles each year, from 1980 to 2008, using the term *worksite* or *workplace* in the title, abstract, or key words (n = 515), among all publications indexed in Medline with the MeSH terms *absenteeism* and *sick leave* (n = 7315). The search was performed in June 2008.

1.3 PERSPECTIVES AND CONCEPTS

Different perspectives are needed to understand what was investigated in the research underlying this thesis. In the present studies, all work environment aspects such as workplace interventions, leadership qualities, and work demands were considered to represent workplace-based efforts to reduce unwanted sick leave or promote RTW. Aspects of evidence-based practice, knowledge translation, and implementation science were also important perspectives in this research.

1.3.1 Sick leave

Sick leave is often regarded as a considerable problem in the working population, but at the same time it is associated with one of the most valued welfare schemes. Having economic security during sickness absence might constitute one of the most important safety nets for all employees, especially when a chronic health problem is involved. In Europe, Norway has historically been among the countries with the highest levels of

sick leave [1]. The rates of such absence vary widely between different sectors and businesses, and also between the sexes. For example, the rate is higher in the public than in the private sector. Of special interest in this thesis is the fact that the sick leave rates in the public sector have been particularly high in the municipalities; for example, in 2006 the rate was 7.7% compared to the national average of 5.8% [41] (i.e., a difference of 25%). Norway has 430 municipalities, which employ people primarily in health care, kindergartens, and schools, and there is a 75% predominance of female personnel. On average sick leave is two percentage points higher for women than for men (see Figure 3).

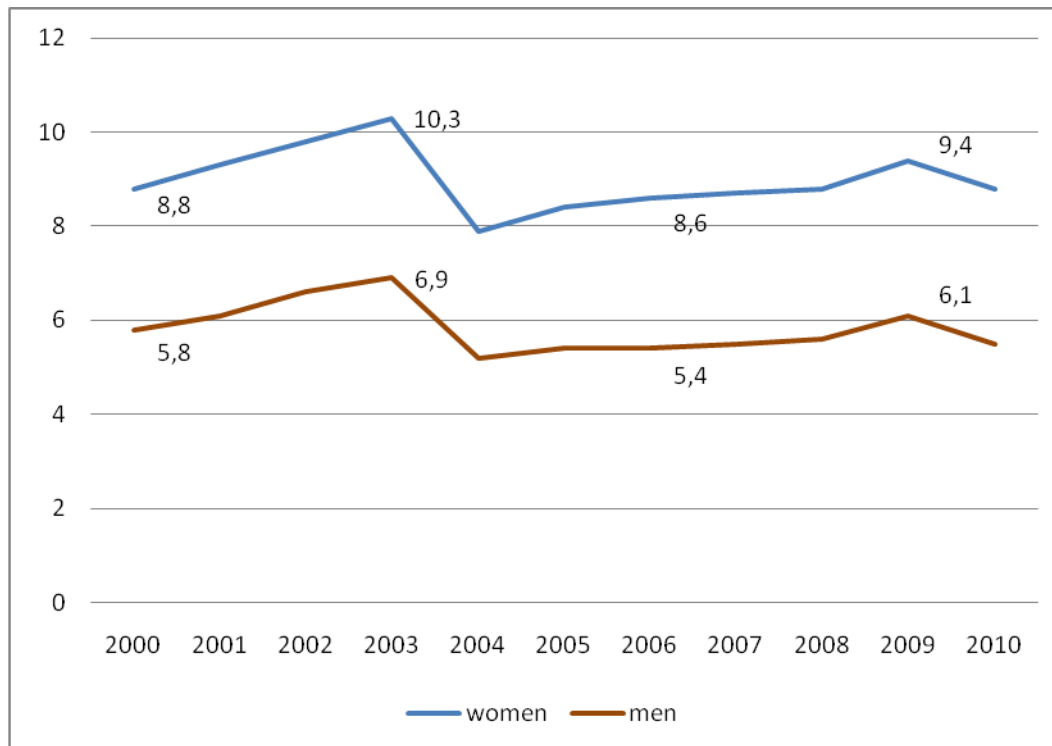


Figure 3. Total sick leave rates in Norway from 2000 to 2010 (percents of lost days). The data were obtained from the national sick leave statistics and represent only the fourth quarter of every year (data source: Statistics Norway).

There is no consensus on what should be regarded as long-term or short-term sick leave [42, 43]. In some investigations, these have been defined based on the sickness absence insurance scheme or the manner in which available data were collected. Nonetheless, in many studies, a period of eight weeks or 56 days or more has been considered long-term sick leave, especially in Norway and Denmark [42-48]. Some have also designated 59 days or more [43], and many other variants can be found in the literature, such as 21 or 28 days, or even 90 days or more [42, 43].

The sickness flexibility model [49] describes sick leave as a person's decision about whether or not to go to work. Several factors have an impact on this decision, such as the possibilities for adjustments and accommodations, the person's motivation in relation to demands and incitements, the health situation itself, and possibly also capacity or competence. This model makes the individual who is contemplating sick leave a core informant who provides a more in-depth understanding of the complex

decision to stay away from work, or the choice to go to work despite a current health problem.

At times it might be experienced as it appears that the reasons for sick leave are viewed as equivalent to the causes of our health problems [40]. This means that curing health problems will automatically reduce sick leave rates. It seems that it might be important to differentiate between those two concepts (i.e., sick leave and health problems), especially in the workplace. Even if a health condition cannot be cured, it might be possible for a person to stay on the job, if adaptations are made in the workplace, work tasks, and working hours. Such interventions have been proven effective for workers on long-term sick leave due to low back pain [50].

1.3.2 Work demands

Work or job demands have been defined in the literature as requirements set by the environment [51], and these can be detrimental if they are not balanced against job resources [52]. The most widely used theoretical model linking work demands to health is called the demand-control model [53-56]. The demands in this case refer to psychological demands, a dimension that comprises questions about how hard people work, organizational constraints on task completion, and conflicting demands. This model combines physiological demands with the level of control, and it sometimes includes physical demands as well [54]. The model was first used to address cardiovascular diseases [57] and later even for musculoskeletal disorders [53-55, 58-67]. Associations between job demands and sickness absence have also been found [68, 69]. However, little research has been done to examine the effects that job demands might have on RTW [65]. The demand-control model has been criticized for not being adapted to human service work [52, 70-72], and other perspectives might be relevant to understanding the demands and their complexity in the associated organizations.

The Model of Human Occupation [73], which was first described in 1985 [74], seeks to explain how occupation is motivated, patterned, and performed [75], and it may also be well suited for studying the relationship between job demands and occupational performance. This model is based on system theory and explains thinking, feeling, and doing as arising out of the interaction between internal components and the environment. The environment is divided into physical and social compartments, which offer several opportunities, resources, demands, and constraints. The way the environment influences behaviour depends on a person's values, interests, personal causation, roles, habits, and performance capacity. Interactions between humans and environments are affected by occupational participation, performance, and skills. Occupational participation is defined as engagement in work, play, or activities of daily living as part of one's socio-cultural context; it refers to doing an occupational form, and occupational skills are the observable, goal-directed actions of a person [73]. The Model of Human Occupation enables us to understand aspects of the disabled worker [76, 77].

It is possible that people experience and interpret work demands in different ways, depending on whether they are or are not on long-term sick leave. The expectations that individuals have of themselves, the expectations from the physical and social

environments, and also the content of the work tasks make disparate demands on employees. The lack of knowledge about how employees on long-term sick leave experience different work demands in the RTW process indicates the need for further studies. This knowledge is crucial for all stakeholders, including the employers, who are responsible for finding effective workplace interventions.

1.3.3 Leadership qualities

As already mentioned, the Sandman report [11] in 2000 and the subsequent Inclusive Working Life Agreement [22] defined the workplace as the main arena for follow-up activities and interventions. The immediate supervisor and the subordinate became the “core actors”, whilst the physician, health personnel, and others were considered “good helpers”. Thus, supervisors in Norway now provide services for prevention of sick leave and promotion of RTW. Therefore, it seems to be of interest to reveal if and how leadership research might explain this role more thoroughly, as well as the challenges involved in this task.

Leadership research has a long history. During the first half of the 20th century it was concentrated on mapping the personal traits of supervisors [78], and a programme on leadership at Ohio State University after World War II contributed to a new focus on the behaviour of supervisors [79]. Several studies have quantified leadership styles and behaviours, the most well known of which are the theories of transformational and transactional leadership [80-82], and task versus relation-/people-oriented leadership. Both these schools were criticized by a third direction—the situational and contingency theories of leadership—for not including situational dependency [83]. Situational theories focused on the interaction between the supervisor and the subordinate, and indicated that supervisors who are able to adjust to different situations are more effective. A literature review conducted in 2005 focused on the relationship between leadership and the health of subordinates [84]. The conclusion drawn in that work was that even though leadership is a well explored topic in the scientific literature, only a few studies have investigated the impact of leadership on subordinates, and even a smaller number have examined how leadership affects the health of subordinates. The authors of that review suggested that leadership is best studied indirectly through other variables, because supervisors have a large impact on factors such as the demands, control, and social support of subordinates, and these strongly influence employee health.

Previous studies have revealed that the risk of long-term sick leave increases with lower social support from the supervisor and with lower management quality. Management and leadership styles can greatly influence injuries, disability, and sick leave. An investigation performed in Denmark found that the risk of long-term sick leave (> 8 weeks) among 1,610 employees at 52 workplaces increased with reduced support from supervisors and lower management quality [46]. Also, a study in Finland showed that a lack of supervisor support for women and a lack of co-worker support for men increased the frequency of sick leave (> 21 days) among 3,895 employees in the private industrial sector [85]. In a study of the Norwegian oil industry, it was observed that the style of and trust in a manager constituted important factors predicting personal injuries, and also that there was a significant negative

correlation between confidence in management and sick leave [86]. Moreover, Halford and Cohen [87] revealed a significant association between managerial support and musculoskeletal symptoms in a self-reported interview-based survey among call-centre workers.

In many cases, an employee on long-term sick leave challenges leadership qualities. In a Swedish focus group study of 23 supervisors [88], the aim was to explore views on employers responsibility in the RTW process. It was found that the participating supervisors defined themselves as key persons who carried the main responsibility for the rehabilitation of employees on sick leave. This responsibility places special demands on supervisors, especially on their leadership qualities. This new leadership role has not been thoroughly described and defined, and many supervisors feel confused and unskilled in this important task. Furthermore, it is not yet clear what type of leadership is most valued by subordinates on long-term sick leave. Providing beneficial supervision might facilitate safe, sustainable, and fast RTW.

1.3.4 Workplace interventions

Since the 1990s, the workplace has gradually been recognised as a core arena for prevention of disease and disability [30, 89-91]. Therefore, workplace interventions are seen as crucial components in the efforts to reduce sick leave and promote RTW [37, 38, 92-95], which has sometimes, but not always, proven to be true [37, 38, 93-99]. How can this discrepancy be explained? A plausible answer is that all the studies have not used the same target group. Some have focused on healthy employees or risk groups, whereas others have targeted people who are on long-term sick leave due to chronic musculoskeletal disorders, and different intervention approaches are often required towards those groups. Also, the types of workplace interventions in the studies have varied widely. In many cases, when one study has demonstrated that workplace interventions are effective and another has shown the opposite, different workplace interventions have been in use [34, 93, 96]. In addition, there has been comprehensive involvement of stakeholders in some studies but not in others. Thus, research efforts have not really achieved an in-depth understanding of the variability of core workplace aspects that are important for preventing sick leave and promoting RTW. This questions the effectiveness of workplace interventions, and it seems that negative or inconclusive research results have been obtained for different target groups and different interventions [34, 93, 96]. Thus it is possible that workplace interventions are viewed primarily in terms of input, output, and transfer characteristics, without enough knowledge of the internal workings; in other words, the implementation is opaque. This might call for black box research to describe workplace interventions in greater detail.

Provision of workplace interventions varies considerably between countries with respect to type, as well as regarding the number of individuals with access to these interventions [50]. In a study conducted in six countries and including 1,631 employees sick leave due to low back pain, a mean of 23.4% of the participants (range 15.0–30.5% between the countries) reported *adaptation of the workplace*, 44.8% (range 41.0–59.2%) reported *adaptation of job tasks*, and 46.0% (range 19.9–62.9%) reported *adaptation of working hours*. Adaptation of the workplace had a positive impact on RTW rates, and adaptation of job tasks and adaptation of working hours were effective in promoting RTW after a period of more than 200 days of sick leave [50]. “*Workplace adaptation* included the realisation of adaptations in workplace including any technical

aids, such as a different chair or desk/table, special tools, a lifting aid, an adapted transport during work. *Adaptation in working hours* involved changes in number and/or pattern of working hours: different shifts, less or more hours (“partial work resumption”), more variation in hours. *Adaptation of job tasks* involved change of job tasks, including minor changes such as not having to carry things” [p. 290].

Complex phenomena such as musculoskeletal disorders and sickness absence [100] often require complex interventions, and thus there is frequently a need for evidence from studies examining implementation of multi-component interventions. In such cases it is important to answer the question of what combinations of interventions can be successful. Multidimensional intervention strategies require the evaluation of many underlying concepts [101]. The International Classification of Functioning, Disability and Health (ICF) developed by the World Health Organization (WHO) [102] is a conceptual biopsychosocial model that describes health and function (see Figure 4). The ICF includes health factors that can be modified by occupational health interventions [103], and it is also useful for categorizing workplace interventions by asking what the intervention is targeting [34].

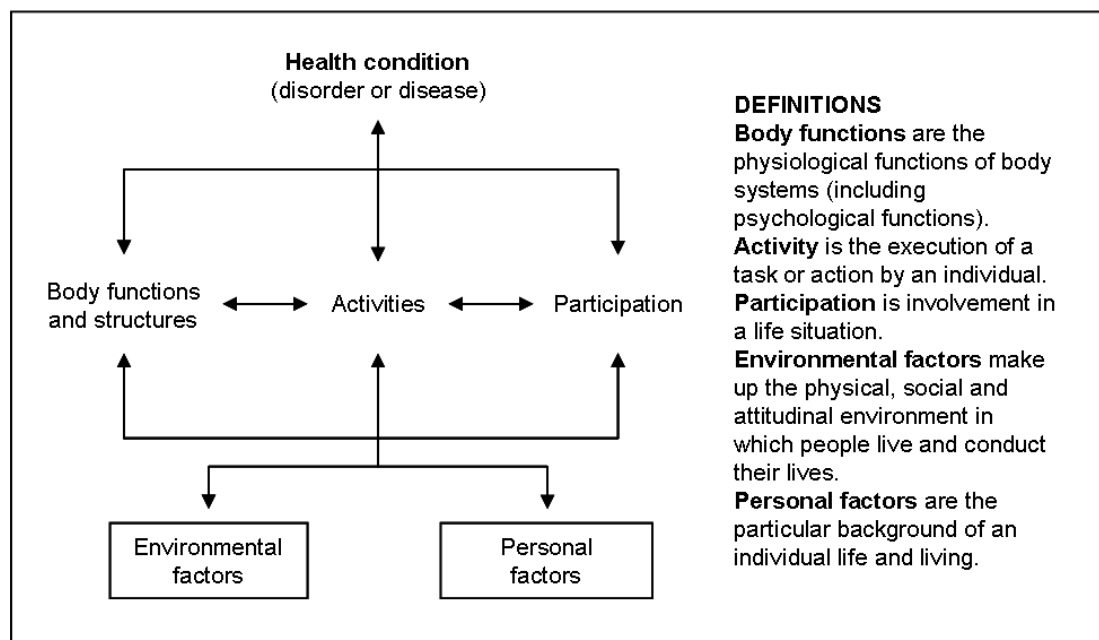


Figure 4. The WHO International Classification of Functioning, Disability and Health (ICF): a model and definitions of the health and health-related components.

The ICF and the International Classification of Diseases (ICD-10) are the two core classification systems developed by the WHO, which include diseases, disorders, and disabilities. The ICF codifies disabilities into different health and health-related dimensions within a framework of up to 1,424 codes. For example, in the field of occupational health, the ICF has been used to describe work-related factors that influence the health of employees [104], to outline the content of specific outcome questionnaires [105], to assess function in relation to sick leave and disablement pension [106], and serve as a conceptual framework to guide the development of a broader perspective of ergonomic interventions [107].

1.3.5 Work disability

The way we perceive work disability has gradually changed. It is now regarded as being the result of a complex interaction between components at the body, individual, and societal levels [102], or the outcome of the interaction between health care, the workplace, and the social security system [108, 109]. Notably, the increasing significance of the environmental aspects in this context has magnified the importance of the workplace as an intervention arena. A focus on reducing the consequences of musculoskeletal disorders (disability prevention), rather than directing all efforts towards preventing diseases, has been proposed as the paradigm of occupational medicine [109].

Employees with diseases or disorders of the musculoskeletal system constitute the largest group of people with sickness absence and disability pension in many industrialized countries [110]. This is also true in Norway (see Table 2), where four of every 10 sick leave days are connected with health problems in the musculoskeletal system. As seen in Table 2, approximately half of the days lost due to musculoskeletal disorders are located in the back or neck/shoulder/arm area.

Table 2. Sick leave diagnoses in Norway from 2001 to 2010 (percent of lost days)

Diagnosis	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Cardiovascular	4.9	4.9	4.8	4.9	4.9	5.1	4.8	4.5	4.5	4.4
Musculoskeletal*	44.9	44.3	43.5	41.8	42.1	40.3	40.4	39.8	39	40.2
Psychiatric	16.8	17.2	17.3	17.6	17.6	18	17.7	18.8	19	19.2
Respiratory	7.6	7.8	8.8	7.3	7.1	7.9	7.5	7.2	8.9	6.8
Pregnancy related	3.7	4.2	4.4	5.3	5.4	5.4	5.5	5.6	5.3	5.3
Other	22.1	21.6	21.2	23.1	22.9	23.3	24.1	24.1	23.3	24.1
*Back	13.7	13.4	12.6	11.8	11.5	10.9	10.7	10.6	10.3	10.5
*Neck/Shoulder/Arm	11.2	11	11	10	10.5	9.9	10	9.7	9.7	10

*Musculoskeletal disorders in the back and neck/shoulder/arm area are specified in the last two rows. The data are from the National Sick Leave Statistics, Norwegian Insurance Office.

An increasing number of people have complex health problems. Rates of work days lost due to musculoskeletal disorders are 42%, 40%, and 33% in Norway, Sweden, and the United States, respectively [111-113]. Furthermore, musculoskeletal disorders are the most common diagnoses for employees on sick leave in many countries [1]. Recurrent chronic pain accounts for a substantial portion of worker absence [112, 114], and the lower back and neck comprise the most common locations of such discomfort. Furthermore, comorbidity is frequently seen in musculoskeletal disorders [115, 116]. In addition to the consequences for the individual, such conditions represent a substantial economic loss for society [117].

Non-specific low back pain represents one of the most frequent and costly health conditions among employees in welfare states [118-121]. The WHO has indicated that low back pain is a leading cause of disability [122]. In as many as 90% of cases, low back pain is non-specific in nature [118]. This type of back pain is characterized by lapses/relapses and comorbidity [115, 123], the latter of which is associated with more frequent work disability [116].

Until now, more studies have focused on back pain, although it seems that neck pain has been more widespread in the general population than was previously known [124]. A recent review [125] showed that neck pain is common in the adult population, with an annual prevalence of 20% to 50% in the majority of the included studies. According to another large review [100], the annual prevalence of neck pain among workers varied considerably across countries, from 27.1% in Norway and 33.7% in the United Kingdom to 47.8% in Quebec, Canada [100]. Furthermore, the individual studies in the latter review showed a 50% prevalence of neck pain among employees with highly different occupations (e.g., dentists, nurses, office workers, and crane operators), whereas the annual prevalence of sick leave due to such pain varied from 5% to 10%. Thereby we could reason that most of those with such pain is at work. Also, office and computer workers were found to have the highest incidence of neck disorders amongst all occupations studied, higher than the prevalence observed in the general population [126].

The causes of musculoskeletal disorders are multifactorial [62, 100, 127]. Self-reported physical exposures such as sedentary positions for prolonged periods, repetitive work, prolonged cervical spine inflexion, working in awkward positions, inadequate keyboard and mouse positions, no chair armrest, and upper extremity posture have been shown to be risk factors for neck pain [58, 59, 100, 128]. Self-reported psychosocial work exposures such as job strain, low co-worker support, decreased job security, and overall stress at work have also been reported to be risk factors for neck pain [100, 128-131]. Individual factors such as age, gender, education [100, 132], and non-work-related aspects also contribute to the prevalence of neck pain [100, 130, 131]. Neck pain is a condition that is characterized by lapses and relapses [133], which in some cases, but not always, result in episodes of sick leave. Due to this complexity, it can be difficult to explain the contribution of different risk factors to the development and exacerbation of problems in the neck and shoulders.

Woods [134] reviewed 52 studies and found that poor social support was strongly correlated with an increased risk of musculoskeletal morbidity as well as limited evidence of a relationship between poor social support and musculoskeletal-disease-related sick leave and not returning to work after suffering from such disorders. Also, employees who have not returned to work within two to three months are at high risk of developing a disability and dropping out of the labour force [135, 136]. Therefore, providing workplace support and interventions that encourage early RTW has been seen as an efficient way to reduce socioeconomic and personal consequences of musculoskeletal disorders [30], and as a crucial factor in reducing the distance between the workplace and the employee who is off sick.

1.3.6 Return to work

The term *return to work*, with the acronym RTW, is being used increasingly in the scientific literature. In a review performed in the field of sickness absence and inclusion/exclusion [42], the databases Medline, PsycINFO, and ISI Web of Science were searched to find terms describing “going back to work”, and, among 617 hits in the titles of scientific articles, ten terms appeared that described this phenomenon (see Table 3). The most frequently used term in this category was RTW (spelled out or

abbreviated to RTW), which appeared in up to 95% percent of the hits in this category. It could be expected that there would be equal distribution of the terms *return to work* versus RTW, but that was not the case: in Medline, the acronym RTW constituted half of the hits, and the fully spelled *return to work* was found more seldom, whereas the opposite was observed in ISI Web of Science. The reason for this difference might be that the concept “RTW” is thus far not as developed in the social sciences as in medicine and health sciences. As can be seen in Table 3, newer terms such as *stable RTW* and *sustained RTW* seldom appeared in the literature.

Table 3. Terms in the literature describing going back to work after a period of absence*

	Term	Total (n)	Medline (%)	PsycInfo (%)	ISI Web (%)
1	Return to work	384	38	24	38
2	RTW	200	50	31	19
3	Work resumption	12	33	33	33
4	Back to work	9	67	22	11
5	Stable return-to-work	5	100		
6	Return back to work	2	50		50
7	Return to work process	2		100	
8	Return from long-term sickness absence	1			100
9	Graded return to work	1	100		
10	Sustained return to work	1		100	

*These terms were found in the titles of articles in this field published in 2009 and 2010 [42].

The term *return to work* represents different concepts in the literature, and there is no consensus on core definitions [42]. Going through some of the literature [37, 38, 45, 50, 65, 88, 92, 94, 95, 97, 137-155] reveals that it is used in at least four disparate ways to describe the following (1) a point in time — this includes the time point of going back to work and is also used as an outcome measure (e.g., the first/second return or early return); (2) a type of work status — this means after a period of sick leave which also includes duration of the status (e.g., returned to work or sustained return to work); (3) a personal process or a rehabilitation process — this indicates going back to work as a process; (4) a type of intervention or a program — initiatives aimed at promoting return to work.

It has been claimed that RTW is a strong endpoint [156]. Simply measuring the first RTW does not describe the stability of work participation. Return as a point in time might be seen as several possible outcomes divided into early or late return. This might concern the first, the second, the third, or the fourth return, or it might be given different degrees extending up till a full return. Also, if RTW becomes more permanent, it might be characterized as sustainable or stable.

As a process, RTW has many similarities with work rehabilitation, occupational rehabilitation, or vocational rehabilitation. In the rehabilitation field, the paradigm shift from “train-then-place” to “place-then-train” approaches [157, 158] has strengthened the value of placement in a real context (as the workplace), early in the rehabilitation process. These approaches originated in the field of psychiatric rehabilitation and were further developed in the programmes called Individual Placement Support and Supported Employment [159, 160]. Their content has also been used in rehabilitation strategies aimed at promoting RTW among employees with musculoskeletal disorders

[161]. Integration of health care and workplace perspectives and competence, involvement of stakeholders, case management, and combining environmental changes with reducing symptoms are typical aspects of these types of interventions. Thus, they have many similar core components, frequently used in cases involving musculoskeletal disorders [37, 89-91, 98, 99, 109, 140, 162, 163]. As in the rehabilitation process, the person in the return process might need support from rehabilitation specialists. A study conducted in Great Britain revealed that as many as four out of ten employees on sick leave did not get rehabilitation support to help them get back on the job [164]. In many countries, RTW Coordinators are given a tailored post-bachelor's education to fill this vital role in the RTW process [149]. An investigation in this field [165] identified this group as a key to programme success and also defined 10 core competencies. Also, an observational study [163] revealed 10 underlying values related to decisions that rehabilitation teams make regarding RTW for employees.

Various determinants have been shown to influence the duration of time off work before returning. An investigation of 7,780 public employees on long-term sick leave in six municipalities in Denmark revealed that sex, ethnicity, and income had an impact on RTW during the entire three-year study period [166]. The cited authors also found that which municipality the people were working in, their diagnoses, and their age had an impact, but these determinants changed over the three years of follow-up, primarily during the first half of the period. Another study revealed that environmental factors are the most common barriers to RTW among injured workers [167]. All of the mentioned findings emphasize the importance of broadening the perspectives beyond the disease or disorder in the process of promoting RTW among sick listed.

1.3.7 Evidence-based practice, knowledge translation, and implementation research

There is a need for more documentary evidence from high-quality research on the effectiveness of interventions in practice [168, 169]. Accordingly, EBP has become a dominant paradigm in health care worldwide [170-172], and the demand from health authorities that practitioners use the best available evidence has gradually increased [173]. The same has occurred in the area of sick leave prevention and promotion of RTW. In short, the actors in that field face the challenge of how EBP should and could be used in situations where decision-making often concerns employees affected by high comorbidity, complex contexts, and substantial work demands.

Today, EBP is strongly tied to the Cochrane Collaboration, an organization named after the epidemiologist and physician Archie Cochrane, who claimed the following in an essay published in 1979 [174]: "It is surely a great criticism of our profession that we have not organized a critical summary, by specialty or subspecialty, adapted periodically, of all relevant randomized controlled trials". In this spirit, the first Cochrane Centre was founded in Oxford in the United Kingdom in February 1992 by the British National Health Service "to facilitate the preparation of systematic reviews of randomised controlled trials of health care" [175]. The Cochrane Library presently provides approximately 6,500 Cochrane systematic reviews of interventions and 650,000 clinical trials, and it has also contributed to the enormous progress in

intervention research. The sibling databases OTseeker and PEDRO for occupational therapists and physical therapists, respectively, also exclusively provide the results of RCTs and systematic reviews.

It appears that the use of scientific evidence from systematic reviews and RCTs can guarantee the prioritization and provision of efficient interventions at a national or group level. However, it might be questioned whether such evidence can determine the intervention choices in individual cases involving complex aetiology and comorbidity [176, 177]. Still, the most common definition of evidence-based medicine, which has also been widely used in health professions and non-medical fields, considers the target as being the individual patient and the process as being an intervention decision: “Evidence-based medicine is the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients” [178 p. 71].

At present, implementing EBP is first and foremost about using knowledge from systematic reviews, RCTs, and clinical guidelines. The PICO² framework has been developed to ensure that such knowledge can be found by practitioners [179-183]. Moreover, the steps of EBP have been implemented to guide that process [169, 183-185]. All these components are intended to enable EBP. Such practice has a clearly recognized aim—to use the best knowledge in intervention decisions—which is not always easy to achieve [186]. Cameron and colleagues [187] showed that most practitioners do not use these sources of knowledge in the planning of interventions, and that this is the case despite the availability of sound evidence [188, 189]. Moreover, some health care professionals reported that levels of knowledge, skills, and involvement were low in EBP [190], and this prompted the performance of several studies attempting to identify the obstacles to implementing this approach. It was found that these barriers included lack of knowledge, confidence, research skills, time, databases, and computers, and there was also an impact of large caseloads, staff shortages, and information deficits and overload [191, 192].

Many suggestions have been made as to why the translation of scientific knowledge can be problematic. In some cases this has been metaphorized as the gap between science and practice [193], with EBP representing “the bridge” between these two “cliffs” [194]. This implies that there are three possible targets for improvements and changes that can increase the translation of scientific evidence in intervention decisions: the patient and the practitioner (cliff A), the evidence (cliff B), and the translation processes (the bridge). Considerable effort has been devoted to the two cliffs. Scientists work hard to ensure the quality of their research results, and the Cochrane Collaboration has made huge contributions to raising the quality of experimental studies, and also to systemizing and synthesizing existing RCTs and systematic reviews in order to increase the availability of these results to practitioners. Furthermore, practitioners have frequently been targeted for behavioural changes, and this is often seen as the core solution for better evidence uptake in practice. In contrast, less has been done to explore and promote the translation process (the bridge). However,

²In the acronym PICO, P stands for patient, I for intervention, C for co-intervention, and O for outcome. This framework is used to steer the process of defining a question that is to guide searches of the scientific literature about effectiveness of relevant interventions.

interest in knowledge translation activities is reportedly increasing [195-201] and includes attempts to fill the gap between scientific evidence and decision-making in practice [195, 196]. Examples of this include national implementation research programmes that have been conducted in the Netherlands, the United Kingdom, and the United States [196]. These efforts are all based on how we define, understand, and view the patient and the practitioner, the scientific evidence, and the translation processes.

Even if it is accepted that a gap exists between evidence and practice, it appears that there remains an implicit assumption that scientific evidence from high-quality RCTs is relevant and suitable in all types of intervention decisions, regardless of case or situation. It is essential to ensure that the uptake of scientific evidence is feasible for health problems of this type in order to allow further development of EBP in workplace occupational rehabilitation. More knowledge is needed about the translational challenges in this type of practice.

Most of the literature in this context has focused on how clinicians could or should change their behaviour to become more evidence based [188]. This gives the impression that the translation challenge might be merely a technical problem rather than a fundamental or normative one, lending itself to solution by educational or collaborative efforts and by increasing available resources. However, McCluskey and Lavarini [202] showed that providing education improved knowledge but did not change behaviour, and thus it is questionable whether the willingness to change is the main problem, or if a more fundamental translation challenge is involved. Also, researchers frequent suggested that producing more research knowledge can solve this evidence uptake problem. Hence it seems that knowledge is still limited regarding the challenges that are involved in this matter. Graham and colleagues [203] ask whether we have got lost in knowledge translation and are thus describing different definitions and suggesting what these authors call a model of the knowledge to action process.

Every year, a number of both small and large intervention programmes are implemented in different parts of the world. These projects vary with respect to their rationales, as well as their knowledge bases and contexts, and how they are facilitated. In the widely used PARiHS framework, successful implementation of interventions programmes is seen simply as a function of the interrelation between three key components: evidence, context, and facilitation [204-207]. Some programmes start by implementing defined and described interventions based on high quality evidence, whereas others begin by using a system of facilitation, or local context engagement, without having a definite evidence-based approach or clearly defined interventions to implement. Thus they are built on experience and common sense. These programmes are “intervention explorative”, and the reasoning behind the choice of interventions can be found in the local workplace arenas. The literature available thus far has reported implementation of only a few such programmes, even though it seems that these initiatives are actually quite common. For this reason, the present research targeted one national programme aimed at preventing sickness absence prevention and promoting RTW.

2 AIMS

The general aim of the research underlying this thesis was to explore some certain aspects of workplace-based sick leave prevention and RTW. This included a focus on workplace interventions (studies III, IV, and V), leadership qualities (study I), and work demands (study II). Additionally, the aim was to reveal the potential challenges and solutions involved in translating scientific knowledge into intervention decisions in the RTW process (study III).

The specific objectives of the individual studies were as follows:

To elucidate leadership qualities that employees on long-term sick leave and their supervisors deem to be of value, when the subordinates are in the process of returning to work (study I).

To identify how employees on long-term sick leave due to musculoskeletal disorders and diseases describe their work demands (study II).

To identify possible challenges in translating scientific evidence into complex intervention decisions (e.g., regarding workplace interventions) for one typical employee on long-term sick leave, and to suggest possible solutions to these challenges (study III).

To identify the workplace interventions that twelve municipalities planned or implemented to reduce sick leave rates (study IV).

To conduct a systematic review of the literature concerning adult employees with neck pain to determine the content and effectiveness of workplace interventions as compared to no treatment, usual care, or other types of workplace interventions (Appendix: study V).

3 MATERIALS AND METHODS

3.1 AN OVERVIEW

The work underlying this thesis included analysis of research results obtained in the present case studies as well as existing published data (a Cochrane systematic review). Table 4 gives an overview of the material and methods used in the studies.

Table 4. Overview of the present studies

	Study I	Study II	Study III	Study IV	Appendix (study V)
Aims	To elucidate leadership qualities in the RTW process that were valued by employees on long-term sick leave and their supervisors	To identify how employees on long-term sick leave due to musculoskeletal disorders or diseases described their work demands	To identify possible challenges in translating scientific evidence into complex workplace intervention decisions, and to suggest possible solutions	To identify the workplace interventions planned or implemented by twelve municipalities to reduce sick leave rates	To determine the content, and effectiveness of workplace interventions for adult workers with neck pain
Design	Case study with an inductive approach	Case study with an inductive approach	A hypothetical case study	Case study with an inductive approach	Systematic review of the literature
Study population	Employees (n = 30) on long-term sick leave and their supervisors (n = 27)	Public sector employees (n = 8) on long-term sick leave	One occupational therapist meeting one typical employee on long-term sick leave	Municipalities (n = 12) participating in a national programme to reduce sick leave rates	Published RCTs (n = 10) including data on 2,745 employees
Data	Transcribed data from individual interviews (n = 57)	Transcribed data from individual interviews (n = 8)	Data on 30 employees on long-term sick leave were analysed to construct a typical employee on sick leave	Documents (n = 81) and transcribed data from focus group interviews (n = 12)	Data from 10 published RCTs deemed relevant after a systematic search of eight scientific databases
Analyses	Qualitative and quantitative content analyses, descriptive analysis, and T-tests	Qualitative and quantitative content analyses	Theoretical analysis	Qualitative and quantitative content analyses	Meta-analysis, GRADE analysis, descriptive analysis, deductive content analysis using ICF

Abbreviations: RTW = return to work; RCT= randomised controlled trial; ICF = International Classification of Functioning, Disability, and Health [102].

3.2 METHODOLOGICAL PERSPECTIVES

An inductive approach was used in the present research. Case study methods were applied in the overall design, and content analysis was the main technique used to

assess qualitative data. These methodological perspectives are further described in this section.

Inductive approach: It is often possible to measure the outcomes of sick leave and RTW, whereas it seems that the aspects of a workplace that might have an impact are difficult to identify, understand, and quantify. Plausibly, a deductive approach that starts with theories and hypotheses and ends with findings [208] might limit the phenomenon under study, if the theories do not cover the complexity of what is studied. This in turn will influence what the findings of the research will be, and hence it is recommended to apply the strategy that is often the opposite of the deductive approach (i.e., the inductive approach) when existing knowledge about the topic under investigation is lacking, limited, or fragmented [209]. Accordingly, the current research mainly used an inductive approach [208-210] to explore workplace aspects that were selected as relevant for sick leave prevention and RTW. This choice is justified by the limited number of specific and detailed theories that have been published, especially concerning leadership qualities, but even about workplace interventions aimed at reducing sick leave and promoting RTW. The first phases of grounded theory [211-214], as well as an inductive content analysis [214-217], are methodologies that extract conceptual knowledge from empirical data [218]. It also seems that theories in this field have less frequently been built on empirical data in which core stakeholders such as persons on long-term sick leave describe their situations themselves, based on their own experiences. Such perspectives might provide new insights into the field of workplace prevention and rehabilitation.

Case study methods: Four of the studies in this thesis used case study methods [208, 219, 220] as an overall design. The rationale for this choice stemmed from the frequently quoted definition given by Yin [220], which states the following: “A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident” [p. 13]. The case is often stipulated as the unit of analysis [208, 220], and here the cases were as follows: in studies I with 30, and in study II eight employees on long-term sick leave; in study III, a rehabilitation team; in study IV, 12 municipalities (e.g., public organizations). This research strategy is known to be a flexible procedure for collecting data and for using combinations of different types of data, often both qualitative and quantitative [208, 220]. Consequently, the division between qualitative and quantitative research is not very evident in this type of research. Furthermore, case study research does not entail traditional statistical generalization towards a defined population from which the sampling is done, but rather involves theoretical or naturalistic generalization [219, 220]. Stake [219] has described naturalistic generalization as “recognising the similarities of objects and issues in and out of context and by sensing the natural co-variations of happenings” [p. 6]. Stake stressed that generalization should be added along with particularization. It is possible that full and thorough knowledge of the particular can become useful understanding even in new and foreign contexts [219].

Content analysis: Content analysis was applied to different types of data in all five of the present studies. Content analysis has its roots dates back to the 17th century, although it was not given a name until 1941 [221]. It is an often used method for data

analyses [215, 216, 222, 223]. Earlier, the most often used data were different types of written or official documents, whereas later interview transcripts and observational logs are more often used [209, 215-217, 221-224]. This method can be used as a combined qualitative and quantitative strategy, as was done here, or as either of those approaches separately [222, 223]. In studies I and II, the first phase of the analysis was qualitative with the aim of obtaining new terminology and understanding of the phenomenon under investigation. The type of content analysis that is more qualitative in nature appeared more recently and was further developed especially in health research [215-217, 224]. The process of content analysis is often inductive and aims to reveal terminology and descriptions close to empirical data. The variety of descriptions is determined by the quality and depth of the data. This phase is performed that is fairly similar to other methods of qualitative analysis, such as for example grounded theory, although the results are often communicated in a different manner (descriptions versus theory). The second phase of the assessments in the current studies represents the more traditional content analysis, in which data (e.g., text or meaning units) are quantified [222, 223]. The second phase differs from the first phase in that the aim is to describe reporting profiles; this makes it possible to construct hypotheses that can later be subjected to deductive hypothesis testing using representative sampling strategies from a defined population, which can enable statistical generalization. Quantification in content analysis is done on the level of words or meaning units, not informants. Thereby, the generalization of results is not statistical in nature. Therefore, it is important to emphasize that the purpose of the quantification conducted in the current investigations was not to achieve statistical generalization, but rather to create new hypotheses that might be further tested in representative studies.

3.3 STUDIES I AND II

Design: Studies I and II were performed as parts of the larger *Rogaland RTW case study*. The research design was built on case study methodology [219, 220], and employees on long-term sick leave constituted the cases. Qualitative and quantitative content analyses [215-217, 222-224] were the main methods used to assess the data.

Informants: Thirty employees were recruited from a selection of 19 companies in different sectors. The employees' immediate supervisors ($n = 28$) were interviewed once. Case study methods was chosen to achieve a flexible approach for data collection, and interviews were performed when needed, and all relevant documents were collected as the process progressed individually and differently. The informants were recruited through their companies, and all recruiting of companies took place over a period of 14 months in 2005 to 2006. An occupational health service was used as a collaborator for recruitments among their member companies. Direct contact was also made with other relevant companies. The sampled companies were selected to ensure diversity regarding size, public versus private sectors, and high versus low rates of sick leave. Such a heterogeneous sample was established in order to obtain a more comprehensive understanding at both the individual and the organizational level. Three public services and sixteen private businesses agreed to participate; these represented health care, social services, schools, kindergartens, service firms, financial firms, and industry. Thirteen of the nineteen were inclusive working life companies, that is, they had signed an agreement with the national insurance office.

The employees were selected with the aid of the company personnel systems, which obtained information concerning the following three selection criteria on the date of recruitment: (1) on sick leave for eight weeks or more during the previous six months due to a personal health situation (i.e., not due to sickness or illness of a family member); (2) on full or partial sick leave; (3) employed by the company at least 50% of full-time during the previous eight weeks. The supervisors were identified as those who had been primarily responsible for following the employee on sick leave during the period of absence. Thus, the informants consisted of a heterogeneous sample of employees ($n = 30$) on long-term sick leave (>8 weeks) due to different diseases or disorders, and also their immediate supervisors ($n = 28$). Several of the included employees comorbidities, and 77% of the subordinates and 69% of the supervisors were women. Some of the 19 services/businesses did not have any employees on long-term sick leave during the period of interest, whereas others did have such employees but declined to participate in the project. Accordingly, the informants in the study came from a selection of the 19 services/businesses. The public sector organizations had higher sick leave rates and more employees, and staff members were easier to recruit, and thus as many as 19 of the 30 informants came from that sector; 11 of those individuals came from health care and seven from schools/kindergartens. All 58 of the informants (subordinates and supervisors) participated in *study I*. The informants in *study II* consisted of a selection of eight female public sector employees with musculoskeletal disorders and diseases. Three were working in nursing homes/home-health care, three in kindergartens/schools, and two in social security or administrative offices.

Data collection: Potential informants were sent a postal invitation asking them to take part in the study. The invitation contained letters from both the researchers and the companies employing the individuals, which assured the prospective participants that their identity would not be divulged to the researchers. The invitation also included written information about the study and asked the recipients to fill in and return an informed consent form if they decided to participate. This meant that the researchers did not know who did not answer. When an employee agreed to take part, his/her supervisor also participated in accordance with an agreement between the company and the researchers. One of the subordinates did not want us to interview her/his supervisor, and another supervisor was never interviewed due to appointment problems. Each case was followed for eight to twelve months. Each person on long-term sick leave was contacted two to eight times during the period, depending on how the process developed. Each immediate supervisor was interviewed once. The employees on sick leave were followed when absent from work, and also after returning to work if that situation arose. A total of 107 interviews were conducted with those on sick leave and 28 with the supervisors. The 135 interviews were recorded digitally and transcribed verbatim. The informants were given open-ended questions from a theme-based interview guide. Some semi-structured interviews were also conducted using the assessment tools Worker Role Interview (WRI) [225] and Work Environmental Impact Scale (WEIS) [226], which have been tested for validity and reliability [227, 228] and are based on the Model of Human Occupation [73, 74, 76]. Relevant documents related to each case and the sickness process were also collected, such as action plans, epicrisis,

medical records, minutes of meetings, sick leave forms, documents from the social insurance office, employers, GPs, specialist health services.

Selections of this large material were analysed in two of the studies: 57 of the 135 interviews in *study I*, and eight interviews performed with WRI and WEIS in *study II*. The documents were not used in these two studies.

Data analysis: All interview soundtracks were transferred from the portable voice recorders to a secure computer network and deleted from the recorder. Names and places were changed to ensure anonymity. Thereafter, the recordings were transcribed verbatim. The interviews were performed in Norwegian, and two independent researchers translated the main results into English, with disagreements resolved by discussion and consensus. Combined qualitative and quantitative content analysis was applied [215-217, 222-224].

In study I, three category levels were identified in the material. The third-level coding involved condensing the meaning in the interviews line by line to reveal descriptions of leadership qualities. In the second-level coding, the phrasings from the informants were used as much as possible when naming the leadership qualities. The first-level coding described leadership types based on leadership qualities. Descriptions were formulated and used to categorize different leadership qualities according to similarity into leadership types. Finally the descriptions of leadership qualities were condensed without the loss of any significant information. Many informants gave the same or very similar descriptions, which we combined. Descriptive statistical analyses using the Statistical Package for the Social Sciences (SPSS, version 15.0) in combination with Microsoft Excel were applied to reveal the reporting profiles and patterns of single informants and informant pairs (subordinate and immediate supervisor), and the differences in reporting between the two informant groups, age groups, genders, sectors, and branches. Independent sample t-tests were performed to compare means of agreements between groups.

In study II, the text was first subjected to a reduction process in which the recorded interviews were transcribed, but inconsequential words were deleted. Meaning was condensed and categorized in order to identify work demands [222, 223, 229]. The transcripts were first read in their entirety in an attempt to discover natural themes. The aim was to find the implicit meaning in the explicit statements, and thereby identify work demands by transforming the meaning into themes. To express the described theme, a phrase was selected as an adequate code for a category, after which the physical demands were identified. In addition, the demands were distinguished having a positive, a negative, or no impact on the work performance, based on the informants' descriptions. The described demands were then sorted into three categories according to whether the sick listed employee regarded themselves or the employer/work environment, or both, as being the maker of the demands.

3.4 STUDY III

Design: Innovative study methodology was applied. A case study was constructed and analysed to identify possible translational challenges and possible solutions to the

challenges. This case study comprised five components (see Figure 5): (1) a physician's referral of a fictitious woman named Denise, described as an employee who was on long-term sick leave due to low back pain and comorbidity, and required workplace interventions; (2) a rehabilitation team at an outpatient RTW clinic that received the referral; (3) the six EBP steps; (4) the PICO framework; (5) the final component consisting of scientific evidence from a high-quality RCT, which was identified using the EBP and PICO components. In short, the initial task was to create a typical person on sick leave for the referral, which was achieved by analysing the empirical data on 30 employees on long-term sick leave. Thereafter, the six EBP steps and the PICO approach were used to manage performance of an EBP process. Next, the challenges in the EBP process were identified by analysing the subsequent reflections. Lastly, the challenges revealed in the EBP process were isolated, presented one by one, and finally systematized into a suggested revision of the EBP steps. These five components are further described below.

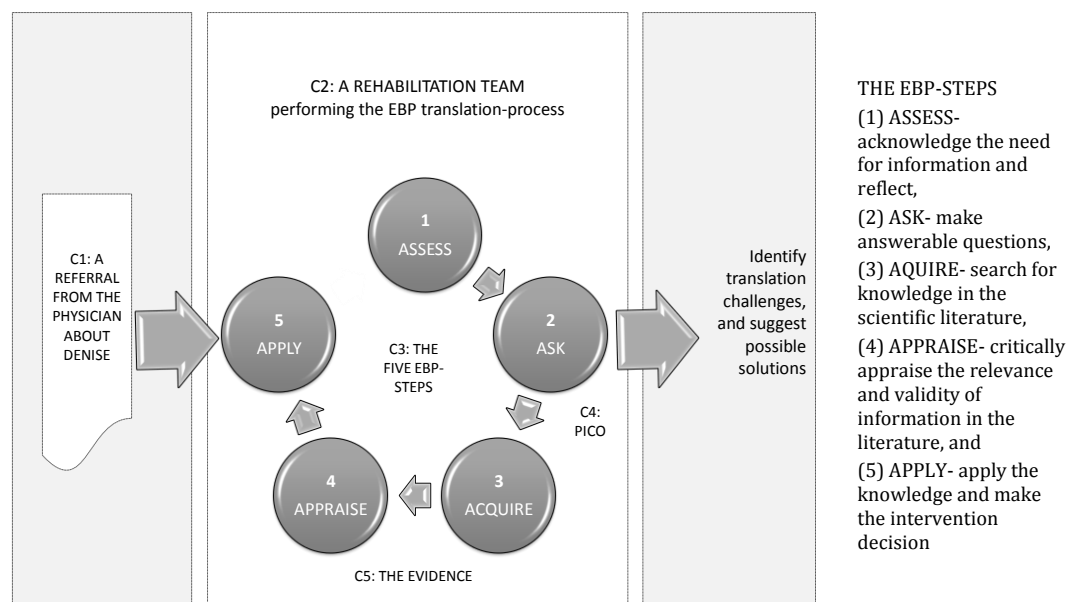


Figure 5. Overview of the five components (C1-C5) of the evidence-based translation process in this constructed case study. These five steps are described in the text.

C1 The referral: The physician's referral gave information about Denise, who was described as a secretary who worked in the public sector and had high comorbidity. The case of the employee Denise was developed from analyses of the core characteristics of 30 employees on long-term sick leave, who were followed for approximately eight months each in the Rogaland RTW study [137, 230, 231]. Several transcripts from 135 interviews with these employees and their immediate supervisors were analysed, along with documents (n = 250) from health care, social insurance offices, and employers. Qualitative content analysis [215-217, 222, 223] were used to identify typical features of the cases, such as age, gender, family situation, occupation, health status, health problems, functioning, work ability, work capacity, and aetiology. The aim was to be able to construct three typical employees on long-term sick leave, and Denise was one

of these. This means that Denise could be regarded as a typical employee on long-term sick leave in the context of the working life and social security systems in Norway.

C2 The team: Denise's referral was sent to a hypothetical rehabilitation team that was organized in an outpatient RTW clinic and worked in close contact with the employees, employers, and workplaces. The RTW clinic had a multi-professional staff including a physician, an occupational therapist, a physiotherapist, and a psychologist. The team gave the responsibility of being Denise's case manager to the occupational therapist Eve, and this involved establishing and maintaining contact with the workplace, social insurance staff, and other health care services. The RTW clinic had already applied an evidence-based approach. Therefore, Eve had learned how to implement and practice EBP according to the steps of such practice and the PICO framework, and she did not encounter any of the problems that are often reported in the literature as being obstacles to EBP. In short, she was confident in performing EBP.

C3 The EBP steps: This hypothetical case study was guided by use of the EBP steps, which are further described here as they appear in the literature. The 4, 5, 6, or 7 steps have been developed to steer the process of performing EBP [176, 179, 180, 182, 184, 232-236]. Summarizing, they involve the following components: (1) ASSESS, acknowledge the need for information and reflect; (2) ASK, create answerable questions; (3) ACQUIRE, search for knowledge in the scientific literature, (4) APPRAISE, critically assess the relevance and validity of information in the literature; (5) APPLY, make use of good knowledge and arrive at a decision. The literature also contains a few exceptions to the above-mentioned steps. Some investigators have also included a sixth step denoted *evaluation* [184] or *dissemination to colleagues or organizations* [234]. One publication included a step after APPRAISE, which was designated *Integrate the evidence with clinical expertise and patient preferences and values* [234], and another article added a step in which the ASK step should be answered on the basis of professional expertise before it is answered by the scientific literature [185]. Bennett and Bennett [169] put forward their four EBP steps (ASK, SEARCH, APPRAISE, USE) as a third frame outside two other frames, which they called (1) the client context and (2) the (occupational therapy) treatment process/therapy context.

C4 The PICO framework: The PICO framework was also used in the hypothetical case study. The "P" in PICO stands for the type of patient, "IC" indicates the type of interventions and co-interventions, and "O" represents the outcome. The PICO framework was developed to enable the practitioner to ask what is often referred to as a good question, an answerable question, a clinical question, an appropriate question, a searchable question, or a well-built question [180-183, 237, 238]. The PICO format is to be used in EBP step 2 (ASK), with the aim of targeting relevant sound evidence in the scientific literature, despite an information overload.

C5 The scientific evidence: The fifth component of the hypothetical case study comprised scientific evidence from systematic reviews, RCTs, and clinical guidelines. Here, high-quality evidence was selected to make it possible to reveal types of challenges other than those concerning methodological limitations and flaws in available studies.

Applying the EBP process to the hypothetical case study: The EBP translation involved going through the EBP steps, and this constituted the context of the analytical process in this study, which was performed to identify the challenges and the solutions.

Step 1 Assess: The case manager Eve started by assessing all knowledge about the case in order to provide evidence-based treatment to the patient. Thus far, the team's knowledge of Denise was derived solely from the information in the referral. Eve determined that the case was multi-factorial. In the EBP course she had attended, Eve had learned to apply scientific evidence from systematic reviews and RCTs of high quality, and that *evidence* is often easy to assess and apply when it is formulated as clinical guidelines. Hence Eve started her work using this type of knowledge.

Step 2 Ask: Eve had learned how to ask answerable questions by using the PICO framework. She attempted to determine which patient group Denise belonged to, remembering that the "P" usually refers to the person's diagnosis. However, Denise had several diagnoses, whereas most of the literature was diagnosis specific. How could this discrepancy be resolved? Eve decided to choose one of the diagnoses, low back pain, which she believed was the disorder that had the most extensive impact on Denise's ability to work. "P" could also refer to the type of job Denise had, so Eve needed to find literature on people working as secretaries in service occupations, as well studies about women in the same age group as Denise. Next, Eve considered the "I" and "C" components of the PICO framework, eliminating therapies that were similar to those Denise had tried previously. The referral from the physician had also indicated that more workplace-targeted interventions were needed. Considering the "O" component, it was obvious what outcome was relevant, because Denise wanted to get back to work as soon as possible. Eve formulated the following PICO question: "*What interventions are effective to achieve a fast RTW for a 35-year-old female secretary with chronic low back pain?*"

Step 3 Acquire: The first thing that Eve did in this step was to look for clinical guidelines concerning chronic low back pain. She found that, for conservative treatments, the European Guidelines for chronic non-specific low back pain [239] recommend cognitive behavioural therapy, supervised exercise therapy, brief educational interventions, and multidisciplinary (bio-psycho-social) interventions. Specific workplace interventions were not covered in those guidelines. Eve then conducted a literature search in the Cochrane Library. Few of the studies she found assessed the outcome of RTW, and most focused on outcomes such as pain and function. Eve used the domains of the WHO International Classification of Functioning, Disability, and Health (ICF) [102] to systematize the interventions in the identified studies, and she found that most of these were aimed almost exclusively at the patient's body functions or body structures. At this stage, Eve considered these types of interventions to be irrelevant for Denise due to her treatment history. Only a few of the interventions included workplace components. Eve subsequently found a review about biopsychosocial rehabilitation of chronic low back pain [240], which described conflicting evidence regarding effectiveness in relation to vocational outcomes. Eve was not sure how to use this observation. She finally found an article that could be relevant to Denise's situation, which described an intervention called a

multidisciplinary rehabilitation programme for back and neck pain [241]. The authors had concluded that this intervention increased RTW in women who were aged 16–60 years, working in service/care occupations, and suffering from back/neck pain. Eve decided to proceed with this promising study.

Step 4 Appraise: Eve pondered the fact that the subjects in the above-mentioned study [241] had been on sick leave for a maximum of 6 months due to spinal pain, whereas Denise had been on full-time sick leave for 9 months. Eve wondered whether this difference rendered the information in that study irrelevant in Denise's case. The third intervention in the cited investigation was called behavioural medicine rehabilitation (BM), which led to outcomes superior to those obtained with the other two interventions and for the control group. The mean number of sick leave days for women was 201.3 less in the BM intervention group than in the control group. Eve considered this to be a good result for "the mean person" in the group, but was eager to determine the effects for a specific individual such as Denise. She found that the BM group consisted of only 20 women and wondered whether the power of the study was sufficient to translate the results to Denise. Eve tried to find the spread of values for the 20 women and noted that the 95% confidence interval (CI) was extremely broad, 1.3 to 403.9. For 95% of those participating in the study, the improvement in the BM group compared to the control group consisted of a reduction of sick leave by a mean of 403.9 more days at "best" and 1.3 more days at "worst". Eve felt that she needed more information about who really did or did not benefit from the intervention. For example, did only a few of the 20 women exhibit enormous improvement, and most of them experience only moderate, limited, or even adverse effects? Did they have neck or back pain? What types of occupation did they have? What kinds of companies did they work for? What types of work did they perform? Eve concluded from the confidence interval that only a few of the women—possibly only one or two—experienced a small adverse effect in the form of having more sick leave days than the average participant in the control group.

Step 5 Apply: Eve was not sure if this intervention programme would comply with Denise's personal preferences, health condition, type of work, occupation pattern, and workplace environment. Even if it was suitable, more information was still needed about how to apply the programme in her case, also taking into consideration the resources and competence that were available. If the intervention programme that was applied to Denise differed too much from the original programme, it would probably not produce the same positive outcome. Eve decided to contact the first author of the study to get information about the intervention programme, so that the rehabilitation team could scrutinize the content. She was eager to be guided by the scientific literature, but felt that a decision regarding type of intervention was still a long way off, even though the EBP steps were completed.

3.5 STUDY IV

Design: The overall design of this project comprised descriptive case study methods [219, 220] with an inductive approach. Qualitative and quantitative content analyses [215-217, 222-224] were the main techniques used to assess the data.

Informants: A national intervention programme was conducted from January 2007 to July 2010 in Norway with the aim of reducing sick leave rates in municipalities. The programme was founded on a tripartite agreement between the government, employers, and employee organizations. Three governmental offices were involved: the Ministry of Local Government and Regional Development, the Ministry of Labour, and the Ministry of Health and Care. A secretariat was created to support the participants in the programme.

Twelve programme municipalities constituted the cases. The municipalities were selected to join by the programme owners on a non-voluntary basis, and the focus was on reducing sick leave rates. Two of the 12 municipalities were chosen as “model participants” because they had long experience of work involving sick leave interventions; the other ten were selected because they had high sick leave rates. The municipal organizations included primary health care units (e.g., home health care, nursing homes, and rehabilitation units), kindergartens, and schools (e.g., primary and lower secondary mandatory levels, grades 1–10); these had 19,611 employees who were responsible for giving service to a total of 256,681 inhabitants. The sick leave rates among these employees varied from 6.6% to 13.9% during the programme period. All municipalities were obligated to organize a tripartite project group with its own leader. Stakeholder involvement was required by employees, employers, union representatives, and politicians. The 12 municipalities were divided equally into two network groups, each including one “model municipality”. The main aim of the networks was to inspire each other in the process of defining and implementing workplace interventions related to sick leave. All organizations were obligated to develop an intervention plan and to execute interventions that would involve a wide range of actors and stakeholders.

Data collection: Two types of data were used: documents (n = 81) and focus group interviews (n = 12). All relevant documents (n = 69) that each municipal had developed within their organization and in their project network during the first six months of the program were collected in the spring 2007. These were provided on request by the programme secretariat or the local project groups. At the end of 2010, revised versions of the intervention plans were collected on the programme’s website. Among other things, these documents consisted of the following: intervention plans (mandatory for all twelve), overall planning documents, sick leave statistics, procedures and routines, project documents, brochures, pamphlets, PowerPoint presentations, and memos from the network seminars. The documents contained information on planned and/or implemented interventions, as well as some information about the rationale for the implemented measures. The project groups (usually all 3–5 members from each) participated in a 30–40-minute-long group interview, and in the leaders of all groups were present. Most of the leaders were from the human resources departments or were unit managers of nursing homes, home-based care, schools, or kindergartens. The focus of the interviews was the participants’ experiences of the various interventions they had planned or provided in the organization. The interviews were audiotaped and transcribed verbatim before analysis. Two of the interviews were not recorded due to technical problems, and these were instead reported as handwritten memos.

Analysis: Qualitative and quantitative content analyses were applied to documents and transcripts to reveal meaning units and categories [215–217, 222, 223] about workplace

interventions. To avoid limiting the phenomenon under study, workplace interventions were defined as “all types of workplace efforts described as being aimed at reducing sick leave, preventing disability, and/or promoting RTW”. The interviews were performed after the first 69 documents had been analysed. To be able to describe and compare interventions for all the cases as a whole, some of the analyses were performed at the intervention level. First, the entire text in each document, except the revised intervention plan, was analysed sentence by sentence to identify meaning units that gave *intervention descriptions* (e.g., planned, ongoing, and implemented interventions). The same process included a search for the rationale and contextual background of the chosen interventions, such as *problem descriptions* (e.g., what problems the municipal experienced in relation to sickness absence), *goal descriptions* (e.g., what goals the organizations had defined for their interventions), and *criteria for success* (e.g., what factors they experienced as important or crucial for achieving the desired results). Thereafter, the condensed texts were re-written as short reports for each municipality and sent to the respective programme teams for verification. All teams were contacted to ensure that these short texts presented the real workplace interventions that were planned or implemented in their organization. These meaning units about intervention descriptions were further coded and categorized on three levels: intervention type, intervention groups, and condensed intervention descriptions. Later, these descriptions were compared with the intervention plans from 2009 to ascertain whether there had been any changes. To enable re-contextualization, the interviews and documents were further analysed to find the reasons for the differences in intervention profiles between the twelve cases.

3.6 APPENDIX (STUDY V)

Design: The design of study V was consistent with the systematic review methodology outlined by the Cochrane Collaboration (www.cochrane.org). All phases of the review work were developed according to the Cochrane Handbook for Systematic Reviews of Interventions [242] and the 2009 Updated Method Guidelines for Systematic Reviews in the Cochrane Back Review Group [243]. We performed three broad comparisons: (1) workplace intervention versus no interventions, (2) workplace intervention versus usual care, and (3) comparison of two or more workplace interventions.

Inclusion/Exclusion criteria: Only RCTs were included, there were no language limitations, and the sole targets were adults who were of working age (18 to 67 years) and were either on the job or were absent (on sick leave, early retirement, or disability pension) but still connected with the workplace through permanent or temporary employment agreements. All sectors, branches, and types of jobs were included. The targeted employees were to have reported neck pain of acute (< 6 weeks), sub-acute (6–12 weeks), or chronic (\geq 12 weeks) duration. Shoulder pain was included only if it was described in conjunction with neck pain. The fluctuating nature of neck pain constituted a challenge when defining the target group for this review, but we solved this problem by including only studies in which at least 50% of the baseline population had neck pain. Neck pain due to specific pathological conditions such as fractures, tumours, infections, inflammatory processes, and ankylosing spondylitis were excluded.

The *interventions* could be a single strategy, or a combination of strategies, with different intervention programme labels (i.e., modified work, participatory ergonomic, ergonomic workplace visit, RTW interventions, or multidisciplinary ergonomic interventions). By use of ICF terminology, we defined workplace intervention as: “any action at the workplace with the aim of preventing health problems and disability, maintaining participation in work and reducing sickness absences, or facilitating early return-to-work. These interventions seek to modify the employees' physical or mental functions, their activity performance, participation challenges or the physical, social or attitudinal environment”. Studies about clinical and health care interventions conducted outside the workplace were excluded. Also, studies were not included if they concerned exercise [244, 245] and multidisciplinary biopsychosocial rehabilitation [246], because those were covered in other Cochrane reviews.

Harms and other adverse effects were included if they were reported in the studies. The timing of outcome measures was reported according to the descriptions used in the included studies, and they were grouped as being short term (measured closest to four weeks after randomization), intermediate term (measured closest to six months after randomization), or long term (measured one year or longer after randomization) [243]. Trials were included if they measured at least one of the following *outcomes* recommended by the Cochrane Back Review Group [243]: pain severity or pain prevalence that was self-reported on a visual analogue scale or the NSR scale, or was measured as the proportion of those with pain; absence from work, considered as time on benefits, number of hours or days on sick leave or lost time, proportion of individuals returning to work, employment status; shift in employment status to working full-time, working part-time, or being on sick leave, disability pension, or early retirement.

Search strategies: Potential trials were identified by computer-aided searches (to July 2009) of these electronic bibliographic databases: CENTRAL (*The Cochrane Library* 2009, issue 3), MEDLINE, EMBASE, CINAHL, PsychINFO, ISI Web of Science, OTseeker (Occupational Therapy Systematic Review of Evidence), and PEDro (the Physiotherapy Evidence Database). The intervention section of the searches was purposely left open, because of the diversity of terms used to describe workplace interventions. References cited in included trials were also screened, and experts in the field were contacted to obtain additional studies.

Data collection: Before selection, the titles and abstracts (if available) of all identified studies were collected and duplicates were removed. We assessed our interpretation of the inclusion criteria in a pilot study of a sample comprising ten articles, some of which we considered to be definitely eligible, some definitely not eligible, and some questionable. The inclusion form was revised in this manner. For all articles that had abstracts that appeared to meet our inclusion criteria, or either lacked abstracts or had abstracts upon which a decision could not be made, the full texts were obtained and independently screened by the same two reviewers to determine whether they met our inclusion criteria. Consensus was used to solve disagreements; if disagreements persisted, a third reviewer was consulted. We dealt with missing data by contacting the original investigators to request the absent information. Furthermore, any assumptions

concerning methods used to cope with missing data were made explicit, and the potential impact of missing data was addressed.

Data analysis: Initially, two reviewers worked independently to *extract data* from the included studies and record them on a standardized form. Twelve criteria were used to assess *the risk of bias* in the included studies [243], and each of these was scored “yes”, “no”, or “unclear”. A trial with low risk of bias was defined as, at the least, having met criteria 1 (randomization), 2 (allocation concealment), 5 (outcome assessor blinding), and any three of the remaining nine criteria. Two reviewers independently assessed the risk of bias in a selection of trials and reached consensus on the final results. A third reviewer assessed the risk of bias in all included studies. Only one meta-analysis could be performed due to between-study diversity of interventions, outcomes, outcome measures, type of workers, and follow-up times. The two studies forming the meta-analysis were homogeneous in that they both focused on the body functions. For the outcomes, odds ratios (ORs) were calculated for dichotomous data, and mean differences were computed for continuous data with 95% CIs.

Some of the studies tested a single intervention, whereas others tested a set of interventions. Therefore, a content analysis of the interventions was performed as outlined in the 10 papers included in the review with the objective of delineating the exact content of the intervention. In these efforts, the ICF [102] was used as a conceptual framework to help describe the components of the intervention(s) in the included studies. Assessments aimed at determining whether a specific intervention is clinically justified should not be based solely on statistically significant findings. Thus, we attempted to address five questions that could help determine the clinical relevance of the interventions [243].

Regardless of whether we had sufficient data to combine the results statistically, we assessed the overall quality of the evidence for our primary outcomes by using an adapted GRADE approach [243, 247]. The quality of the evidence for a specific outcome was based on the performance against five domains: limitations of the study design, inconsistency, indirectness (inability to generalize), imprecision of results (insufficient or imprecise data), and publication bias across all studies that measured the outcome. Two review authors worked independently to perform the GRADE analysis. Initially, the quality was good when at least two RCTs with a low risk of bias provided results for the outcome, and it was reduced by one level for each of the subsequent domains that were not met: *High quality evidence*. At least 75% of RCTs with no limitations of the study design, consistent, direct and precise data and no known or suspected publication biases. Further research is unlikely to change either the estimate or our confidence in the results. *Moderate quality evidence*. One of the domains was not met. Further research is likely to have an important impact on our confidence in the estimate of effect and might change the estimate. *Low quality evidence*. Two of the domains were not met. Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate. *Very low quality evidence*. Three of the domains were not met. We are very uncertain about the estimate. *No evidence*. No RCTs were identified that addressed this outcome.

3.7 ETHICS

The Rogaland RTW case study (studies I and II) was approved by the Regional Medical Ethics Committee for Western Norway on 2 February 2005. It was initially planned that the project would collect data about self-exclusion and drop-outs, but this was not approved by the Ethics Committee, because there was a risk that the informants could be identified. For the same reason, we were not allowed to give information about how many participants came from each company.

The Norwegian National Ethics Committee for Medical and Health Research reviewed the plan for Study IV and deemed that this investigation did not have to be submitted for ethical approval.

4 RESULTS

4.1 AN OVERVIEW

The main results of the five studies included in this thesis are presented in Table 5.

Table 5. Overview of the main results of the present research

	Aim	Main results
Study I	To elucidate leadership qualities that were valued in the RTW process by employees on long-term sick leave and their supervisors	Altogether, 78 distinct leadership qualities and seven leadership types were identified from 345 meaning units. The three most valued leadership qualities were “ability to make contact”, “being considerate”, and “being understanding”. The three most valued leadership types were those we (based on the analysis) designated Protector, Problem-Solver, and Contact-Maker. The subordinates more often described the types called Encourager, Recognizer, and Protector, whereas the supervisors most often mentioned the Responsibility-Maker and the Problem-Solver. Together, Protector and Problem-Solver represented the combination of leadership types that was reported most often.
Study II	To identify how employees on long-term sick leave due to musculoskeletal disorders and diseases described work demands	Fifty-one work demands were described, most of which were emotional and cognitive, and only five were of a physical nature. Work demands were sometimes described merely as negative or positive, but also as both. Most of the negative demands were emotional and cognitive challenges in mastering the work tasks, and they were claimed to have been experienced by the employee herself (n = 36), and in only a few cases by the employer/environment (n = 7) or both (n = 8).
Study III	To identify challenges and possible solutions in translating scientific evidence into complex workplace intervention decisions	Various challenges arose when a health care personnel was to work according to EBP on a case involving RTW. Evidence from RCTs seemed to differ depending on whether it originated from interventions with preventive, curative, or rehabilitative aims. Moreover, it appeared that in some instances evidence came from “good-for-all” interventions but at other times from “tailored-type” interventions. Thus, it was found that there was a need to differentiate the roles of evidence in terms of whether it inspired, challenged, enlightened, informed, or determined the intervention decision. In general, the EBP steps and PICO framework seemed to construct a confined decision process. Possible solutions to the 10 challenges and revised EBP steps were suggested.
Study IV	To identify the workplace interventions that twelve municipalities planned or implemented to reduce sick leave rates	Fifteen workplace interventions (WIs) were identified and were categorized into two groups based on their targets in the organizations: nine <i>organizational WIs</i> , targeted structures, processes, and/or culture in the organization (n = 220 descriptions, 72%); six were called <i>employee WIs</i> , because they targeted employees (n = 86 descriptions, 28%). The organizational WIs involved running a process in the organization from assessment to evaluation, but also development of routines/systems, cooperation/collaboration, information/education, building culture/anchoring, and recruitment/staffing. The employee WIs involved well-being/lifestyle interventions, physical activity/exercise, redeployment, adaptation, follow-up of persons on sick leave, and RTW programmes. The intervention profiles varied considerably between the municipalities.
Appendix (Study V)	To conduct a systematic review of the scientific literature regarding adult employees with neck pain to determine the content and effectiveness of workplace interventions	From 1995 references found, 10 RCTs (2,745 employees) were included. Two had a low risk of bias. Eight examined office workers. Few workers were on sick leave. Thus, WIs were seldom designed to improve RTW. The WIs comprised education about stress management, principles of ergonomics, anatomy, musculoskeletal disorders, and the importance of physical activity. They taught “pause exercises”, how to use a relaxed work posture, proper positioning, the importance of rest breaks, and strategies to improve relaxation. Some studies also included how to modify work tasks, workload, working techniques, positions, and work hours. Several studies suggested how to make adjustments and recommended modifications at the workplace. Overall, there was low quality evidence that showed no significant differences between WIs and no intervention for pain prevalence or severity. There was moderate quality evidence (one study, 415 workers) that a four-component WI was significantly more effective in reducing sick leave in the intermediate term (OR 0.56, 95% CI 0.33 to 0.95). If present, significant results in favour of WIs were not sustained across follow-up times.

Abbreviations: EBP = evidence-based practice; WI = workplace intervention; RCT = randomized controlled trial; OR = odds ratio; CI = confidence interval.

4.2 STUDY I

In study I, 345 descriptions (meaning units) of leadership qualities were identified, which were categorized into 78 distinct leadership qualities. The five most valued of these qualities were “ability to make contact”, “being considerate”, “being understanding”, “being empathic”, and “being appreciative”.

The 78 leadership qualities were further categorized into seven leadership types, which are presented in Table 6, defined on the basis of the 78 leadership qualities. The three most valued leadership types were as follows: the considerate, empathic, and protective type called the *Protector* (n = 87); the competent and problem-solving type called the *Problem-Solver* (n = 80), and the contact-making and interactive leadership type designated the *Contact-Maker* (n = 62). The subordinates more often described the *Encourager*, *Recognizer*, and *Protector* types, whereas the supervisors most often described the *Responsibility-Maker* and the *Problem-Solver*. Also, the youngest subordinates (aged < 45 years) wanted to be recognized (*Recognizer*) and encouraged (*Encourager*), whereas the oldest employees more frequently referred to supervisors who solved problems (*Problem-Solver*) and challenged the employees (*Responsibility-Maker*).

Table 6. Seven leadership types defined on the basis of the 78 leadership qualities

Leadership type	Definition based on the 78 leadership qualities
The Protector	Protects the employee, understands the situation, helps, and includes. Shows compassion, is discreet, warm, and friendly.
The Problem-Solver	Professional, solution oriented, and creative. Can, among other things, change the work tasks or in other ways adapt them so that the employee can continue to work. Takes responsibility and provides individual handling.
The Contact Maker	Gets in touch with the absent employee to inform about what is happening in the workplace. Is also interested in how the employee is doing, and proves to be a listening and able conversationalist.
The Trust Creator	Is discreet, predictable, attentive, honest, and open. Creates trust and a feeling of safety.
The Recognizer	Behaves in a recognizing and confirming manner, without prejudice towards the employee. Shows respect and confidence.
The Encourager	Has a positive attitude and is generous and cheerful. Motivates, inspires, and is available. This type of manager has a sense of humour and is also fair, patient, and encouraging.
The Responsibility-Maker	Assertive, fearless, challenging, and direct. Is honest and to the point, and is not afraid to establish boundaries or confront. Gives the employee challenges and responsibility that fit his/her own situation.

Together, the Protector and Problem-Solver represented the two-type combination that was reported most often. The triple combination indicated most frequently included the Protector, the Problem-Solver, and the Contact-Maker.

The mean number of descriptions of leadership qualities was 5.85 (SD 3.04, range 0–13), 5.50 (SD 2.98, range 2–12) for subordinates and 6.21 (SD 3.1, range 0–13) for supervisors. Fifty-three percent of the leadership qualities were mentioned only once (n = 25) or twice (n = 16). Of the 78 leadership qualities, only 10 were mentioned more than 10 times. Thus, this study revealed that there is a wide spectrum of valued leadership qualities.

4.3 STUDY II

In study II, eight female public sector employees on long-term sick leave due to musculoskeletal problems experienced mostly cognitive and emotional demands, and defined themselves as the work-demand claimers. These employees were subject to many highly complex work demands simultaneously.

Fifty-one work demands were described, only five of which were physical in nature. It was often felt that a large number of the demands interfered with work performance in more than one way. For example, the demands of being attentive were experienced as interfering in a positive, a neutral, and a negative way. All the informants had musculoskeletal disorders or diseases that might have resulted from physical demands in the work environment. Still, the employees on sick leave mentioned physical demands less often than non-physical demands, although the former were often described very clearly. Most of the negative demands consisted of emotional and cognitive challenges related to mastering the work tasks. The employees' descriptions indicating that work demands exerted positive, neutral, or negative effects on work performance showed that activities comprising physical demands were often perceived as negative.

Demands related to planning, organizing, structuring, and prioritizing work tasks were often viewed as negative, because they involved the pressure of being efficient and meeting deadlines. The employees had to be flexible and able to cope with stress, in addition to being service-minded and capable of handling conflicts and setting limits. This was described as the employees' choice between taking care of their own health and saving time. However, demands such as being able to organize one's own workload and being flexible and co-operative were also recounted as exerting positive effects on employee work performance. Moreover, the responsibility and professionalism in providing appropriate health care and interactions were experienced as positive work demands, as were the abilities to engage in appropriate interactions, be empathic, handle conflicts, and set limits. It was clear that the employees considered flexibility and variation to be positive factors when performing work tasks and routines, and also coping with stress. Being valuable to others was also mentioned as an emotionally positive demand in the work situation. Some cognitive and emotional demands were described as being only positive. However, cognitive demands that were experienced as positive could also be experienced as emotionally negative, and vice versa.

It was felt that most of the demands ($n = 36$) were made by the employees themselves, and that only a few were made by the employer/environment ($n = 7$), or by both ($n = 8$). Thus, the work environment was seldom seen as the source of demands, and, if it was, this was often in combination with one's own demands and those of the employer or the work environment. The work tasks and the work environment were viewed as given, almost rigid, conditions. Coping with stress, handling conflicts, dealing with a large workload, being pressed for time, prioritizing, being flexible, and showing perseverance were described as demands that the informants themselves made, and the same applied to organizing, structuring, and planning. Consequently, they attributed work-task failures mainly to themselves and seldom to the environment. Demands such

as managing daily routines, following procedures, and working within crucial constraints were described as coming from the employer and/or work environment. Other demands of external origin concerned variation in work tasks, the social and physical environments, and especially the need for efficiency.

4.4 STUDY III

Study III revealed ten challenges that arise when implementing EBP frameworks in a return to work process. Table 7 presents an overview of these challenges, including descriptions and possible solutions.

Table 7. Descriptions and possible solutions of the ten challenges that were revealed

#	Challenge	Description	Possible solutions
1	Sorting and subsuming into predefined categories	The patients in the studies often had simpler diagnoses than those seen in real life, which makes it difficult to use the evidence.	Allow multi-level interventions that target more than one diagnosis in RTCs and systematic reviews, since this reflects real situations in complex practices.
2	Degree of intervention flexibility	The interventions described in the RCTs are too rigid to be adapted to other persons.	Promote “frame-type” interventions with flexible elements that enable tailored interventions (such as supported employment).
3	Possibility of re-using interventions in new situations	Interventions in RCTs were not described thoroughly and are therefore hard to reproduce.	Provide descriptions of intervention programmes given in RCTs, in the Cochrane Library*, OTseeker*, and Pedro*.
4	Interventions available in the literature	The interventions used in practice are not that same as those in focus in the scientific literature.	Strengthen collaborative efforts towards practice to increase the adequacy and relevance of interventions that are tested in RCTs.
5	Translating average group results to individuals	It is difficult to apply the mean results to individuals.	Provide more information in published RTC-reports on characteristics of who did benefit from treatment and who did not.
6	Relevance of the outcome	In systematic reviews and RCTs, many interventions are considered and described as ineffective, but relevant outcomes are not assessed.	Based on ICF terminology, develop consensus regarding outcomes that should be used to report effectiveness of interventions.
7	Role of the scientific evidence	The role of scientific evidence seems to differ regarding whether it inspires, challenges, enlightens, informs, or determines the intervention decision.	Apply a wider understanding of the role of each type of evidence, deciding whether it should determine, inform, enlighten, challenge or inspire the decision making.
8	Aim of the interventions	The interventions seem to differ when the aim varies between rehabilitation, cure, and prevention.	Discuss further whether intervention decisions concerning preventive, curative, or rehabilitative aims do differ, and provide scientific knowledge about this.
9	Complexity of the interventions	The interventions in the studies were on a continuum from simple to complex, which could challenge the intervention decision in different ways.	Differentiate between simple and multi-level interventions, as the latter might challenge the translation process the most.
10	Potential to tailor interventions	The interventions in the studies seemed unequal, some being “good-for-all” interventions and others more tailored to individual participants.	Separate “good-for-all-interventions” from “tailored-interventions” as evidence might be applied differently in these categories.

Abbreviations: RCT = randomized controlled trial; ICF = International Classification of Functioning, Disability, and Health [102]. *The Cochrane Library, OTseeker, and PEDRO are databases containing RCTs and systematic reviews.

The evidence seemed to differ depending on whether it was from interventions with preventive, curative, or rehabilitative aims. Moreover, in some cases evidence appeared to originate from “good-for-all” interventions and in others from “tailored-type” interventions. Thus, it was revealed that there is a need to differentiate the role of the evidence in terms of whether it inspires, challenges, enlightens, informs, or determines the intervention decision.

In general, it seemed that the existing EBP steps and the PICO framework constructed a confined decision process. Therefore, revised EBP-steps, based upon results from this hypothetical case study were suggested (see study III).

In addition, one of the EBP steps (no. 3 Acquire) was to search for knowledge in the scientific literature. We searched The Cochrane Library to find articles about interventions for low back pain, and thus Study III gave results regarding the content of such interventions described in RCTs and systematic reviews included in the Cochrane database. This search and analysis revealed few workplace interventions, but a high diversity of clinical interventions. Table 8 shows the content of the identified interventions for low back pain.

Table 8. Interventions for low-back pain used in published international studies of effectiveness

Interventions listed according to type of study		
Target* (ICF)		
Body structure and body function (incl. psychological functions)	Cochrane Reviews/Protocols	Single studies: Clinical trials**
	Acupuncture, Antidepressants, Back schools, Behavioural treatment, Botulinum toxin, Chiropractic interventions, Disk replacement (total), Electrical nerve stimulation, Exercise, therapy, Herbal medicine, Injection therapy, Insoles, Laser therapy, Lumbar support, Manual therapy, Massage, Muscle relaxants, Neuroreflexotherapy, Non-steroidal anti-inflammatory drugs, Opioids, Patient education, Prolotherapy injections, Physical examination for lumbar radiculopathy, Radiofrequency denervation, Spinal manipulative therapy, Superficial heat or cold, Traction	Acupuncture, Aerobic training, Anterior discectomy, Anti-inflammatory drugs, ATEAM, Attentional strategi (pain fear), Auriculotherapy, Avinza, Baklosan, Balneotherapy, Biofreeze, Botulinum toxins, Calcitonin, Celecoxib, Chiropractic, Cognitive behavioural treatment, Comprehensive group training, Conservative treatment, Cyclobenzaprine, Depo-Medrol, Dexametopofen, Diclofenack, Dorsal ramus block, Drug therapy, Duloxetine, Dynamic-strength exercise, Education on return to work status (fear avoidance), Electrotherapy, Eperisone hydrochloride, Ergometric training program, Etanercept, Exercise (individual-group), Extensor strengthening program, Feldenkrais therapy, Fluoroscopic caudal injections, Functional restoration, Function-centred rehab, Fusion surgery, Graded exercise, Graded <i>in vivo</i> exposure, Heat therapy, Information booklet on pain persistence, Informative approach, Injection, Integrative medicine, Kuesu point, Laser, Leg lock brace, Lornoxicam, Lumbar fixation, Lumbar fusion, Lumbar support/belt, Lumbar stimulation belt, Magnetotherapy, Massage, Manipulation, Manual therapy, Meditation, McKenzie therapy, Mensendieck exercise, Microcurrent therapy, Mind-body program, Mobilization program, Motivation for self-care, Motor control learning, Movement training, Muscle relaxant, Muscle training, Naprapathic manual therapy, Neuropathic care, Neuroreflexotherapy, Nimesulide, Non-surgical treatment, Opioid therapy, Oscillating blade, Osteopathic manipulation, Oxygen-ozone therapy, Oxymorphone, Ozone therapy, Pain management, Physical strength treatments, Pilates, Piroxicam-beta-cyclodextrin, Pregabalin, Problem-solving training, Psychological intervention, Psychosocial education, Radiofrequency, Radiography, Reflexology, Roprtrotherapy, Sagittal spinal alignment, Sensory discrimination training, Spinal cord stimulation, Spinal manipulation, Spinal nerve root infiltration, Stabilization techniques, Stress management program, Stretching, Steroid injections, Surgery, Sustained-release morphine, Tai Chi, Tapentadol, Thiocolchicoside, Traction technique, Tramadol, Transdermal fentanyl, TENS, TTM-based motivational counselling, Yoga, Valdecocib, Water gymnastics, Wet-cupping
	Activity	Bed rest, Manual material handling advices, Physical conditioning programmes for improving work outcomes, Staying active
	Participation	Active sick leave
	Environment	Workplace interventions, Assistive devices
Combinations/others	Multidisciplinary bio-psychosocial rehabilitation, General interventions for pregnant with back pain	Problem-solving therapy, Back schools, Behavioural rehabilitation programs, Biopsychosocial intervention, Classification-based physical therapy, Client centred therapy, Collaboration, Integrated care, Guidelines, Mini-intervention, Modern rehabilitation, Multidisciplinary rehab. Programs, Multistage RTW program, Occupational rehabilitation, Patient education, Physiotherapy, Rehabilitation programs, Therapy based on clinical guidelines, Treatment-based classification system, Innovative work related multidisciplinary program

* The identified studies were sorted according to the WHO ICF [102]**Including randomized and clinical controlled trials (RCTs and CCTs).Note: The search was done on 22 July 2010 in the Cochrane Library database, including the Cochrane Database of Systematic Reviews, and the Cochrane Central Register of Controlled Trials (CENTRAL), using low back pain or back pain in the title as the search strategy.

4.5 STUDY IV

In study IV, 306 condensed meaning units about workplace interventions were identified in various documents and focus group interviews. Based on similarity, these were categorized into 15 types of workplace interventions, which were divided into two intervention groups according to their targets in the organizations: nine *organizational-workplace interventions* (organizational workplace interventions) that targeted structures, processes and culture (n = 220 descriptions, 72%); six *employee-workplace interventions* (employee workplace interventions) that targeted persons (n = 86 descriptions, 28%). The workplace interventions were provided as ordinary organizational activities or as organized projects. The 15 workplace interventions are presented in Figure 6.

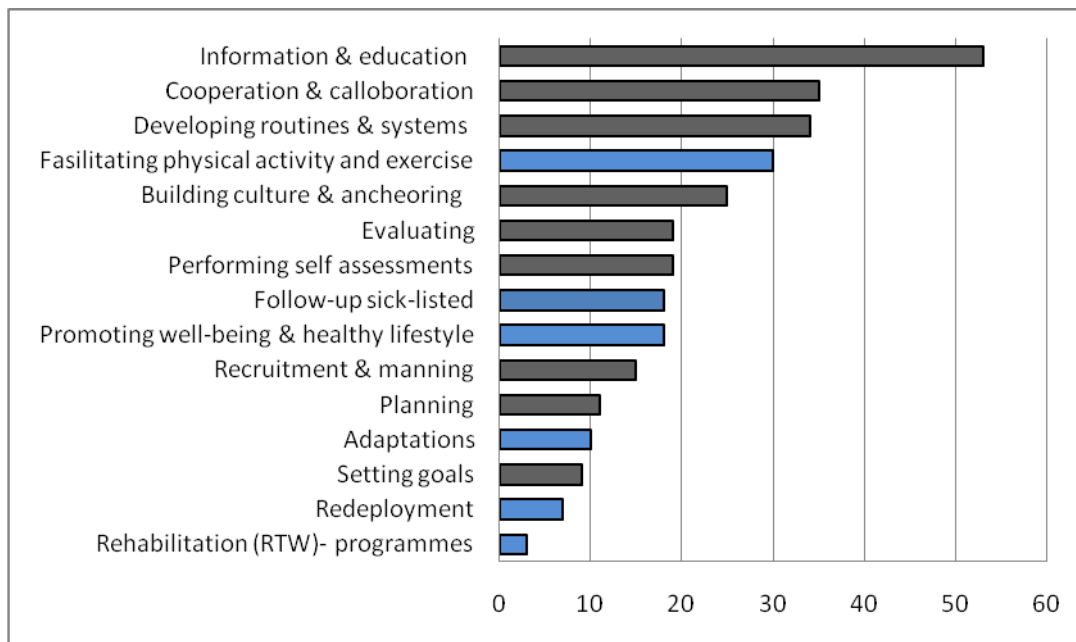


Figure 6. Number of workplace intervention descriptions within each of the categories resulting in 15 workplace interventions that were identified. The diagram illustrates employee-workplace interventions (blue bars) and organizational-workplace-interventions (black bars).

Many organizational workplace interventions were described, comprising four *process* organizational workplace interventions and five *structural/cultural* organizational workplace interventions. Such a WI involved running a process to reduce sickness absence within the organization, which ranged from assessment to evaluation. *Developing routines and systems* was connected with the general health and safety processes in the organization, including control of deviation from health and safety procedures, and systems for reporting and revision. The most frequently mentioned routines concerned follow-up of employees on sick leave. The informants further emphasized that *cooperation and collaboration* were crucial, and these entailed actions and systems for securing cooperation between stakeholders and actors in the RTW process. The standards that were mentioned were closeness, earliness, goal-oriented processes, and defined roles. *Information and education* were regarded as being provided on a regular basis. Rich descriptions of how, what, where, and towards whom these interventions should be directed were identified. Another important area was

building culture and anchoring. These efforts involved four important aspects: securing involvement, ownership, attitudes, and making people becoming conscious of the causes of high rates of sick leave. *Recruitment and staffing* involved how to organize recruitment of disabled and how to adapt a work environment that made it possible to retain work.

There were six employee workplace interventions: two that were primary preventive and four that were secondary preventive. *Well-being and lifestyle interventions* contained a spectrum of different social, nutrition, smoking, and welfare initiatives. *Facilitating physical activity and exercise* involved several types of exercise offers. *Redeployment* entailed providing alternative jobs or tasks. *Adaptation* comprised a few descriptions of how to adopt the physical environment or the working hours. *Following up employees on sick leave* included dialogue meetings and follow-up plans, both to be executed as early as possible; it was also recommended that extra follow-up be offered to risk groups such as employees on long-term sick leave, pregnant employees, and employees with mental problems. *RTW programmes* targeted employees who were on sick leave or were disabled due to musculoskeletal problems.

The intervention profiles in the organizations in the municipalities varied considerably regarding both the frequency and the content of the interventions. No plausible reasons for this dissimilarity were found. The three most frequent intervention groups were *information and education*, *developing routines and systems*, and *cooperation and collaboration*; these represented 40% of all interventions and 55% of the organizational workplace interventions. *Physical activity and exercise* together with *promoting well-being and lifestyle* constituted more than 50% of all the interventions in the employee WI group. Each organization's intervention profile varied greatly with respect to how many descriptions were given (mean 26, SD 14, min. 14, max. 51), and also regarding what type of intervention was planned or had been implemented. All but one of the included organizations gave descriptions of more organizational workplace interventions than employee workplace interventions.

The documents and the interview transcripts were further analysed to re-contextualize the interventions and to try to ascertain why the organizations' intervention profiles were so different. Some possible plausible explanations were found in the documents that were used as a source of data, but these could not explain all the variation that was revealed. When analysing the interviews, the most obvious reason appeared to be the large differences between the organizational competence with regard to inclusion of the aspects of working life related to ideology, goals and efforts, self-insight, consciousness, anchoring of the sick leave problem from top to bottom, proactive skills, and attitudes towards sickness absence and disabilities.

4.6 APPENDIX (STUDY V)

Study V was a Cochrane systematic review in which the literature searches identified 1,995 references. Ten RCTs (2,745 employees) were included in our investigation. Two of them were assessed as having low risk of bias (see Figure 7), and eight of them examined office workers, few of whom were on sick leave. Thus, workplace interventions were seldom designed to improve RTW.

	Adequate sequence generation?	Allocation concealment?	Blinding? (All outcomes - participants?)	Blinding? (All outcomes - providers?)	Blinding? (All outcomes - outcome assessors?)	Incomplete outcome data addressed? (All outcomes - drop-outs?)	Incomplete outcome data addressed? (All outcomes - ITT analysis?)	Free of selective reporting?	Similarity of baseline characteristics?	Co-interventions avoided or similar?	Compliance acceptable?	Timing outcome assessments similar?
Bernaards 2007	+	+	-	-	+	-	+	+	+	+	-	+
Fostervold 2006	+	+	-	-	-	+	+	+	+	+	+	+
Hauka 2008	+	+	-	-	+	+	+	+	+	+	+	+
Hedge 1999	+	-	-	-	+	-	-	+	+	+	+	+
Horneij 2001	+	?	-	-	+	-	+	+	+	+	+	+
Kamwendo 1991	+	?	-	-	?	?	?	+	?	+	+	+
Ketola 2002	+	?	-	-	+	+	+	+	+	+	?	+
Morken 2002a	+	+	-	-	-	+	+	+	+	+	+	+
van den Heuvel 2003	+	-	-	-	-	+	+	+	-	+	+	+
Voerman 2007	+	?	-	-	-	+	+	+	+	+	+	+

Figure 7. Risk of bias assessment of ten included studies

The workplace interventions were provided separately or as different combinations of intervention programmes. Altogether, six types of intervention combinations were used in six studies: one had four components [248], one had three components [249], and four had different combinations of two components [250-253]. Five studies provided single-component workplace interventions focused on mental health education[254], physical education, relaxation and breaks [251, 255], and physical environmental modifications [256, 257]. Table 9 presents an overview of the interventions in the ten included studies, using the authors' own terms and mapped onto uniform terminology of the ICF [102]. The included studies examined three types of interventions targeting the ICF the Body Functions domain: education for mental health, education for physical health, and relaxation/breaks. The mental health education interventions focused on behavioural change, stress management, and coping with high work demands. The other two types were combined into one group (see Table 9), because they both targeted musculoskeletal body functions, principles of ergonomics, anatomy, musculoskeletal disorders, and the importance of physical activity. They taught pause exercises, how to

use a relaxed work posture, proper positioning, the importance of rest breaks, and strategies to improve relaxation. Interventions targeting the Activity domain were seen less often, and these were described as modifying work tasks, workload, work techniques, work positions, and work hours. They were defined during group meetings or workplace visits. Interventions targeting the Environmental domain modified the physical environment, and they were often individually tailored subsequent to an assessment performed during a workplace visit or a group session that identified individual needs. Some of these (e.g., downward-tilting computer keyboards or screen angle modifications) were also given to all employees in the included workplaces. In most cases, several adjustments and alterations of the existing furniture and work equipment were provided. Education for physical health, relaxation, breaks, and physical modifications to the environment were the interventions examined most often in the included studies. No interventions targeted modifications of the two ICF domains social or attitudinal environments and participation or personal factors.

All ten of the included studies assessed pain as an outcome, and data were available for seven of those. In all the studies, there was low quality evidence that showed no significant differences between workplace interventions and no intervention for pain prevalence or severity. If present, significant results in favour of workplace interventions were not sustained across follow-up times.

Only three studies assessed sick leave as an outcome, and data were available for only one of those. There was moderate quality evidence (one study, 415 workers) [248] that a four-component WI was significantly more effective in reducing sickness absence in the intermediate term (OR 0.56, 95% CI 0.33 to 0.95), but not in the short term (OR 0.83, 95% CI 0.52 to 1.34) or the long term (OR 1.28, 95% CI 0.73 to 2.26). These negative findings might be explained by the fact that only a small proportion of the workers were on sick leave.

Table 9. The content of workplace interventions in ten randomized controlled trials

Study Intervention(s)	<i>Detailed intervention descriptions according to ICF terminology</i>		
	Body function mental health education	Body function physical education and relaxation breaks	Activity modification
Bernaards 2007 Work style group (WS) Lifestyle physical activity group (WSPA)	WS: Increasing awareness of coping with high work demands, and adjusting workplace accordingly	WS: Awareness of effects of taking break, body posture, and workplace adjustments WSPA: Moderate to heavy physical activities	
Fostervold 2006 Computer screen angle: high line of sight (HLS)/low line of sight (LLS)			
Haukka 2008 Participatory ergonomic intervention (PEI)	Phase 1: Pre-implementation, active workshop to identify mental workload	Phase 1: Active workshop with ergonomic identification of risks and planning of solutions	Phase 2: Implementation of 402 ergonomic changes
Horneij 2001 Workplace stress management group	Identify and reach goals and strategies for stress (from lack of social support, low decision latitude, high psychological work load)		
Hedge 1999 Downward-tilting keyboard on a tray			
Kamwendo 1991 Traditional neck school (TNS) Reinforced neck school (RNS)	RNS: Interview by a psychologist regarding psychosocial work factors to create a personal coping strategy	TNS: Education about body function and ergonomics, including pause-gymnastics and relaxation	

Table 9. Continued

Study/ Intervention(s)	<i>Detailed intervention descriptions according to ICF terminology</i>			
	Body function mental health education	Body function physical education and relaxation breaks	Activity modifications	Environment modifications
Ketola 2002 Intensive ergonomics (IE) Ergonomic education (EE)		IE: Worksite visit; to take breaks during work and pay attention to work posture; active. Active participation of the employee. EE: Group training session: Encourage to take short pauses		IE: Worksite visit; to take breaks during work and pay attention to work posture; active. Active participation of the employee. EE: Group training session: Encourage to take short pauses
Morken 2002a Group sessions about coping with MSDs at the workplace		Group meetings on 10 different topics, such as MSDs and coping with symptoms of those disorders	Group meetings on 10 different topics, such as working techniques and positions	Group meetings on 10 different topics, such as working techniques and positions
van den Heuvel 2003 Rest breaks (RB) Rest breaks (RB) + exercise (E)		RB: Five minutes rest every 35 minutes introduced by a computer program. E: Four physical exercises		
Voerman 2007 Ambulant myo-feedback training (MT) Ergonomic counselling (EC)		MTEC: Instructed to relax in response to the myo-feedback	EC: Workplace visit including ergonomic investigation (work task, work hours, workload)	EC: Workplace visit including ergonomic investigation (work task, work hours, workload)

5 DISCUSSION

5.1 SUBSTANTIAL DISCUSSION

The *overall* aim of the present research was to explore workplace-based sick leave prevention and RTW regarding aspects such as workplace interventions (studies III, IV, and V), leadership qualities (study I), and work demands (study II). The intention was also to reveal challenges and possible solutions in translating scientific knowledge into intervention decisions in the RTW process (study III). The findings of the investigations are discussed in this chapter.

5.1.1 Leadership qualities

One of the current goals was to ascertain what leadership qualities were valued by employees on long-term sick leave and their supervisors, when the subordinates were in the process of getting back on the job. The most important findings were the identification of 78 distinct leadership qualities and, in particular, the qualitative descriptions of those features. It was also noted that the leadership qualities valued by the informants differed markedly, which might be explained by substantial variability in personal preferences, working tasks, and contextual factors. This suggests that each case should be addressed using a tailored approach, and hence that standardized leadership qualities will only meet the needs of a few. This observation is supported by the situational theories of leadership [83], which indicate that effective leadership depends on the ability to adjust to unique situations.

Another finding was that the leadership qualities described most often concerned being protected (e.g., the Protector), which implies that the ability to provide social support might be the most important characteristic of a supervisor. It appears that several of the leadership qualities revealed in this study represent different kinds of social support, which agrees with the four types reported by House [258]: emotional support, instrumental support, informational support, and appraisal. Notably, Johnsen [31] argued that social support is a basic need in the workplace and therefore added it to the often used demand-control model [54, 55]. This model, divided social support into that provided by supervisors and that given by co-workers, and the former included the supervisor paying attention, helping to get work done, and creating good teamwork [54].

Shaw and colleagues [259] investigated the employee's perspective on the supervisor's role in aiding workers after injuries, and they found that interpersonal aspects of supervision might be as important as accommodating physical work.

The employees considered here focused more on the Recognizer and Encourager than on the Problem-Solver or Responsible-maker, whereas their supervisors showed the opposite, most often describing the Responsible-Maker and the Problem-Solver. This disparity might be explained by the different roles of the subordinate and the supervisor. The supervisor is responsible for both the overall delivery towards management and all necessary adaptations, whereas the subordinate needs to protect

his/her own health status in relation to the demands of the employer. The two leadership types denoted Responsible-Maker and Problem-Solver were also more often described by those aged 45 years or older. This suggests that younger subordinates need more recognition, encouragement, and protection than their older counterparts in a situation involving sickness absence, although this assumption needs to be confirmed in large, representative studies. The need for a balance between relation-oriented and task- or action-oriented leadership has been described in leadership theories over the past 50 years [80-82, 84]. The current findings support such a dichotomy between tasks oriented leadership versus relation oriented leadership, but they also make relationships, tasks, and actions more specific (e.g., for solving problems and for ensuring that the employees take responsibility for their own health and sick leave situations). They even concern actions and relations aimed at protecting, recognizing, and encouraging employees on long-term sick leave.

5.1.2 Work demands

One objective of this research was to identify how employees on long-term sick leave due to musculoskeletal disorders described their work demands. The first finding in this context was that these employees mentioned mostly demands of non-physical origin (i.e., cognitive and emotional demands). Nonetheless, a few physical demands were stated in precise terms, and they were all experienced as exerting negative effects on work performance, although it was indicated that several of these also had positive effects. A previous study [260] showed that, regardless of their diagnoses, female employees on long-term sick leave often viewed the physiological pain connected with their illnesses or injuries as the main reason for their inability to fulfil their work tasks. This might also apply to our subjects who were employees on sick leave due to musculoskeletal problems, since these conditions are often associated with pain, which might increase in intensity when performing physically demanding tasks and thus cause the tasks to be perceived as impossible to carry out.

Most of the demands described by the informants were cognitive and emotional in nature. Indeed, all the participants mentioned emotional demands, which is rather surprising considering that results in the literature indicate that such demands are generally not strongly associated with either risk factors for [63, 129] or work absence caused by [261, 262] musculoskeletal complaints. However, it should be pointed out that emotional demands have been studied chiefly in relation to burnout, or to musculoskeletal problems in a few studies, even though there are indications that they may constitute a risk factor for developing shoulder and neck complaints [263]. Emotions have been suggested to play an important role in service work, because it requires interactions with clients and customers [264], and emotions have also been indicated as a risk factor for burnout [265]. Therefore, it seems that there is a need to broaden perspectives when studying demands in relation to musculoskeletal health and associated sickness absence. Furthermore, this conclusion is underscored by the present results, which agree with other authors' descriptions of demands in human service organizations [52]. Such organizations can be very complex and large, and hence they may produce associations between demands and complaints and sickness absence that are more complicated than is predicted by many of the traditional models.

The emotional and cognitive demands were perceived as exerting both positive and negative effects on work performance. A recent study in Sweden showed that positive feelings about work were associated with high work attendance in human services [266]. It has also been found that the psychosocial work environment has an important influence on whether employees can stay on the job [267], although the assessment tools used in that investigation focused mainly on physical factors.

The current results also suggest the importance of broadening the perspective of employees who are absent due to musculoskeletal disorders, which means that occupational rehabilitation should include all categories of demands that exist within a specific occupation. Furthermore, it was clear that the employees felt that work demands came from themselves, not from the employer or the work environment. This might have been due to the contextual situation in which they were working. Many demands stated as being made by an employee occurred within activities involving a client. Clients are considered to be a raw material in human service organizations, which has been described as follows: “the core activities of the organization are structured to process, sustain or change people who come under its jurisdiction” [268, p. 30]. This is illustrated by a recent study showing that teachers had high ideals for their relationships with their pupils, and they felt that their identities were related to their experience of this interaction and their intense ambitions and goals for their job [269]. When relations between an employee and a client become very important, the employee might place much of the responsibility for the performance of work on him-/herself, and trust his/her own abilities to a greater extent than would be the case in other occupational groups. This might lead to the work being perceived as the responsibility of the individual worker, which in turn could result in gradual deterioration of the person’s health and eventually give rise to long-term sick leave.

There are several potential mechanisms linking this individualized responsibility with such absence. Previous studies have found that the level of sickness presenteeism (i.e., working when sick) is higher for occupational groups within human services than for other groups, and that the rates of back/neck pain and fatigue are higher for those with more extensive sickness presenteeism [270]. Working when sick might impair recuperation, and it has been suggested that this can be an important mediator between job stressors and ill health [271], and also lead to prolonged sick leave. Another plausible explanation is that an individual employee who is given the responsibility for work tasks (e.g., dealing with clients) might disregard his/her own symptoms or neglect to mention them to superiors.

In the present research, the Model of Human Occupation [73, 74] served as a conceptual theory to aid understanding of work demands, and the Worker Role Interview [225, 228] and Work Environment Impact Scale [226, 227] based on this model were used as the qualitative assessment tools. The Model of Human Occupation is a framework that can help explain disabled workers in their environments [76], and thus it provides a holistic approach to work-related rehabilitation [77]. The demand-control model [54, 55] has most often been used to assess demands determined by the environment [51], and thus it would not have produced the same results in our study. More specifically, the large number of emotional demands described by the participants would probably not have been captured, since they are not included in the model. This might also apply to the

large number of demands made by the employees. If this finding is related to the context rather than health in organizations where the outcome is based on individual employee-client relations, it is possible that demands on work performance exist other than those defined externally. Perhaps such demands are related to underlying norms and values for the profession or occupational group, and thus they might not be easily captured by traditional epidemiological methods. In a study considering job demands and sickness absence among employees in the public and private sectors in Sweden [43, 68], it was concluded that the demand-control model was better at predicting sickness absence in the private sector than in the public sector. This might be explained by failure of the model to account for the special challenges that face employees in human service organizations, which should be taken into consideration when attempting to identify risk factors for and causes of absence, and when attempting to facilitate RTW within these organizations.

5.1.3 Workplace interventions

Three of the studies included in this thesis focused on workplace interventions aimed at preventing sick leave and promoting RTW. These are discussed from the following four viewpoints: (1) contents and types of workplace interventions (studies III, IV, and V); (2) frequency and profile of workplace interventions between organizations (study IV); (3) combinations of workplace interventions for individuals and organizations (studies III, IV, and V); and (4) effectiveness of workplace interventions (studies IV and V).

5.1.3.1 Contents and types of workplace interventions

Study IV was conducted to identify the workplace interventions that twelve municipalities planned and/or implemented to reduce sick leave rates among all employees in primary health care, schools, and kindergartens. In Study III all types of interventions reported in international investigations about effectiveness of interventions targeting low back pain were identified. The systematic review (study V) was carried out to identify the content of the workplace interventions targeting employees with neck pain in the 10 included RCTs. All three of these investigations indicated that the interventions comprised comprehensive and highly varying measures intended to prevent sick leave and promote RTW, as discussed further below.

Study I identified 15 workplace interventions: nine of these were designated *organizational workplace interventions* and targeted structures, processes, and culture; the other six were denoted *employee workplace interventions* and targeted people. The attempts to reduce sick leave made by the 12 organizations included in this investigation provided us with 306 highly variable descriptions of employer-implemented workplace interventions. Surprisingly, more of these were *organizational* than *employee-oriented* in character, and those of the latter type were few and limited. Seven of ten descriptions (meaning units) were about *organizational interventions*, that were dominated by *information and education*, *cooperation and collaboration*, and *developing routines and systems*. The organizational interventions were described as requiring continuous pressure over time in order to be effective, which means that a willingness to earmark the needed resources for this sick-leave-preventing work might

require dedicated and goal-oriented leadership to be successfully implemented [206]. Egan and colleagues [272] reviewed the literature to determine how complex social interventions aimed at promoting health are put into effect, and they found four types of workplace initiatives in 103 studies: employee participation, changing job tasks, changing work shifts, and shortening work weeks. None of these were extensively represented in the present research.

Few organizational workplace interventions were found in the literature (studies III and V). Study IV analysed the 150 different types of employee-targeted interventions for low back pain that were available in the Cochrane Library, most of which were clinical in nature and primarily concerned drugs, physical exercise/therapy, and psychological/cognitive therapy. Also, according to ICF [102], as many as 90% of these interventions targeted bodily structures and functions rather than activity, participation, and environmental aspects. Only a small number of investigations about effective reduction of low back pain concerned interventions provided in the workplace. Study V included a content analysis of the interventions used in the 10 RCTs, most of which focused on musculoskeletal functions, although some were intended to modify the physical environment. However, these interventions varied considerably with regard to specific content, duration, intensity and methodology, and they also differed substantially from those found in studies III and IV. Educational approaches dominated, and they concerned stress management, principles of ergonomics, anatomy, musculoskeletal disorders, and the importance of physical activity. They taught pause exercises, how to use a relaxed work posture, proper positioning, the importance of rest breaks, and strategies to improve relaxation. Some investigations also included how to modify work tasks, workloads, work techniques, working positions, and working hours. Several studies suggested how to make adjustments and recommended alternatives to the existing furniture and equipment in the workplace.

It might be assumed that an organizational workplace intervention is a prerequisite for an employee workplace intervention. For example, an organization that has high competence in disability management [24, 26, 28, 29] and well-developed follow-up routines for meetings and cooperation with social insurance and general practitioners might be well prepared to provide a workplace intervention aimed at facilitating RTW for individual employees. Literature reviews have shown that cooperation between health care and workplace actors is important to promote RTW for employees on sick leave [38, 94]. In the 12 municipalities included in study IV, employee workplace interventions were seldom mentioned and only sparsely described, with the exception of the initiative designated *physical activity and exercise*. Employee workplace intervention as *adaptations* was mentioned in only five of the 12 municipal organizations, even though this type of measure is often seen as a key to enabling employees to manage their work despite an existing disability or pain, fatigue, or some other disorder [50, 91]. Anema and colleagues [50] found 60 types of workplace adaptations in use in one RTW programme [50]. *Return to work programmes* was mentioned by only two of the organizations in study IV. Well-designed RTW programmes have been proven effective in reducing sick leave [38, 93, 95], but none of those were included in the programme described in study IV, possibly because the actors in the municipalities had no knowledge or evidence of these interventions.

The descriptions of interventions concerning follow-up of employees on sick leave were not as limited. However, they concerned formal, more technical aspects such as applying routines, holding dialogue meetings, making follow-up-plans, and conducting discussions, and they did not consider the content, competence, or components of the interventions. A possible reason for this lack of emphasis and descriptions is that the RTW programmes and adaptation were supported by other stakeholders, such as the occupational health service personnel, GPs, other health care workers, or the social insurance office. However, if that was the case, it should probably have been discernible in all the documents and interviews, for example, as a description of a workplace visit for all employees on sick leave for more than four weeks, which has been shown to be effective in promoting RTW [38]. All 12 organizations in this project were also required to develop a plan regarding their intended and ongoing sick leave interventions, and to present this plan to everyone in their networks. Under these circumstances, it would be natural to be eager to include all current or envisaged efforts. The participants were also given the opportunity to correct their plans after they had been analysed by the scientists, and they all confirmed the contents.

So how could these interventions be designed so differently? Was it due to pronounced disparities in the aims of the interventions, the groups targeted by the interventions, the competence of those who designed the interventions, or the context in which the interventions were implemented? All these alternatives might be relevant, but it seems that they can explain only part of the variation found. Is it possible that we in general lack a total overview of what interventions are available to choose from, so that intervention packages are selected at random? At the same time, it is also apparent that these workplace interventions in the 12 municipalities differed markedly from the content of the interventions in the 10 RCTs targeting neck pain (study V) and the 150 lower back pain interventions found in the Cochrane Library (study IV). One reason for this might be that the interventions used in the investigations found in the literature were designed by researchers and health care clinicians, whereas the interventions in the 12 municipalities were developed by workplace actors. Perhaps a guide for designing RTW-promoting programmes is needed.

Still, the amount of literature considering the content of workplace interventions has increased, and the authors are describing what they call workplace interventions, workplace RTW interventions, RTW interventions, RTW programmes, workplace-oriented interventions, work rehabilitation, or multidisciplinary programmes [37, 38, 91, 93, 95, 97, 101, 139, 146, 273]. But does the use of different terms indicate differences in the content of the interventions? This variation might be due to the traditions of the researchers to use different terminology to describe essentially the same type of interventions.

It seems that the interventions reported in the literature have been designed primarily to promote fast and sustainable RTW for employees who are on long-term sick leave, often due to musculoskeletal disorders and comorbidity [115, 116]. The target groups we found in our studies were broader and also included employees who were not on sick leave but had pain (study V), as well as those who were only at risk of health problems and sickness absence (study IV). Thus the results of these investigations might widen the perspective on what workplace interventions are and can be in real life. This might

help enable us to be more successful in differentiating between these type of interventions in the future.

5.1.3.2 Frequency and profile of workplace interventions between organizations

Study IV revealed large differences between the 12 municipalities with regard to the number of interventions used or planned. It is striking and surprising that this initially supposedly joint network could end up with such variation in the design and implementation of interventions. While three of the organizations had 44 to 50 intervention descriptions, five others had only 14 to 17. Obviously, this could not have been a random occurrence, but another plausible explanation is that more detailed descriptions were given when there were many interventions to describe. However, that assumption is not supported by the data. In short, even though the meaning units were unequal with respect to how well they were described, no systematic difference could be discerned between the organizations. Another explanation might be that the number of intervention descriptions varied due to different needs and possibilities within the organizations. For example, perhaps the smaller organizations needed fewer interventions, or they might have had less resources for developing interventions compared to the larger organizations. This pattern was not observed in the data, nor could any rationale for this large variation be found in the reasoning behind the intervention choices. Thus it seems that this cannot be explained as arising from disparate needs in the different organizations.

In the often-used PARiHS framework, successful implementation of intervention programmes is seen simply as a function of the interrelation between three key components: evidence, context, and facilitation [204-207]. In the national 12-municipality programme in Norway (study IV), the context was developed to be ready for implementation of workplace interventions and was facilitated by creation of a national secretariat including experience-based knowledge on implementation. However, evidence was not available for the programme groups in each of the 12 organizations, and therefore the type and number of interventions to be implemented were chosen randomly. This might explain the differences between the organizations. Nevertheless, they were supposed to learn from each other in a network model, although the experiences shared about interventions were not based on evidence.

5.1.3.3 Combinations of workplace interventions for individuals and organizations

Complex problems might require multifaceted interventions. This is reflected in the variation in the combinations of implemented interventions that we found both between the organizations (study IV) and between individual employees (study V). Study IV revealed that only two of the 12 organizations had described 14 of the 15 types of workplace interventions, and one organization had described only seven. Some were especially focused on one intervention, as exemplified by municipality I, for which half of the intervention descriptions concerned *physical activity and exercise*. The balance between organizational and employee workplace interventions also varied. Some of the municipalities had almost no employee interventions, even though they had a wide range of organizational interventions. Also, organizational interventions constituted 95% of the descriptions in one municipality but only 35% in another. The reason for

this discrepancy might be that the municipalities were not aware of this imbalance, because they lacked the overview that was provided by the intervention terminology retrieved from our study. This intervention practice might be described as “groping in the dark”.

Study V even considered the number of components that each of the ten included RCT-studies had. Six workplace interventions were found to comprise more than one component, and some also included clinical or health care interventions together with workplace interventions. There were both single and compound interventions, and there were differences regarding whether the interventions were adjusted to fit the needs of individuals or standardized and/or delivered to groups. All workplace adjustment strategies were to some extent individually tailored based on existing knowledge or experimental ideas. Notwithstanding, educational approaches were used in most cases, although it might be questioned whether education alone can suffice to change behaviour, or if this strategy should be combined with other types of intervention components. It seems that many of the interventions in the 10 RCTs were not based on cumulative traditions, and that some of the tested interventions were founded on hypotheses and models that were developed on an ad hoc basis rather than using previously published evidence. In addition, few multi-targeted interventions were conceptualized. It is possible that use of the ICF[102] contributed to a conceptual frame of reference grounded in a common multidisciplinary terminology.

The research findings that are available today give few answers about what combinations of organizational and employee workplace interventions are most effective in reducing sick leave rates. We also need to know more about what combinations of workplace and clinical interventions can be beneficial [34, 40, 93].

5.1.3.4 Effectiveness of workplace interventions

This research revealed two types of initiatives, which was designated organizational workplace interventions and employee workplace interventions. The findings of the analysis of intervention studies in the literature (Studies III and V) suggest that there is only limited evidence of the success and implementation of *organizational workplace interventions*. This is simply due to the observation that few studies reported in the literature have focused on this type of workplace interventions, which might make it difficult to apply EBP. By comparison, employee workplace interventions were more common in the literature, even though clinical interventions were most abundant. Study IV revealed two types of employee workplace interventions: those aimed at preventing health problems and/or sick leave, and those intended to promote RTW.

The objective of the present systematic literature review was to examine published investigations to determine the effectiveness of providing workplace interventions as compared to offering no treatment, ordinary care, or other workplace initiatives to adult workers with neck pain. Mostly preventive employee-focused interventions were used in the 10 included RCTs, and these were aimed primarily at preventing symptoms such as pain and also sick leave in some cases. Accordingly, the present results almost exclusively concern the effectiveness of employee workplace interventions in preventing symptoms in employees with neck pain. We found mainly low quality

evidence that indicated no significant differences between workplace interventions, and no interventions for pain prevalence or pain severity. None of the significant results favouring workplace interventions for pain were sustained over different follow-up times. Only one investigation (comprising 415 workers) had data available on sickness absence, and it provided moderate quality evidence that a four-component workplace intervention was significantly more effective in reducing sick leave in the intermediate term, but not in the short or long term.

Considering outcomes of symptoms, we scrutinized the publications included in our review to find relief of neck pain in employees. The prognosis and the effects of treatment are generally less optimistic for neck pain than for low back pain [1-4]. However, several risk factors have been identified in relation to intensive computer work, such as keyboard position with small elbow angles, inadequate mouse position, high screen placement, and chairs lacking arm rests [5]. The incidence of health problems in workplace settings is also affected by psychosocial factors such as high demand, low control, and low support at work [6]. Thus it seems that interventions intended to deal with these factors should reduce neck pain, but unfortunately the findings of the present review provide no strong evidence that using primarily educational workplace interventions and environmental physical modifications can achieve that goal. However, the results should be interpreted with caution considering the small number of studies and participants included in the analysis, and because only two of the ten studies had a low risk of bias. A review focused on computer users conducted at the Institute for Work and Health in Canada provided moderate evidence that workstation adjustments and rest breaks, together with exercise, had no impact on pain symptoms, whereas alternative pointing devices had a positive effect on such symptoms [7]. However, the findings of that review with respect to various ergonomic interventions were inconsistent or gave insufficient evidence. Another Cochrane review that concerned several types of musculoskeletal disorders also found that workplace interventions failed to reduce symptoms [8]. It appears that it can be difficult to apply the risk literature directly in the design and implementation of interventions in a complex context such as the workplace.

According to the PARiSH framework, successful implementation is a function of the nature and type of evidence, the qualities of the context in which the evidence is being introduced, and the way the implementation is facilitated [9-13]. If the context is not readily or actively involved, it seems doubtful whether workplace interventions alone can result in a sustainable effect. A literature review of the health effects of workplace interventions revealed a lack of reporting on how the interventions were actually implemented [14], and such information might be essential when introducing workplace interventions in the future.

When discussing the research results concerning sickness absence, it is important to keep in mind that the effort of preventing sick leave was not expressed as being of high priority in any of the studies included in our review, and that few of the participants in the studies were actually on sick leave. It seems unrealistic to expect to be able to reduce a nearly non-existent phenomenon like sickness absence, and yet one of the included studies with low risk of bias [15] did report a significant finding about such absence. However, the outcome measure used to assess sick leave in that investigation

did not capture the total frequency of lost days (the result was based on proportions of employees on sick leave for a three month period, not hours/days of absence). This is discussed further in the section on methodological considerations.

Studies focused on measures used to help employees in the workplace often call them RTW workplace interventions. Are those comparable to the workplace interventions provided in the studies included in our review? RTW workplace-based interventions have been observed to significantly reduce sick leave [8, 16, 17]. In a review of 10 studies of employees off sick due to musculoskeletal disorders or other pain-related conditions, Franche and colleagues [17] found strong evidence that RTW was significantly improved by work accommodation and early contact between health care providers and the workplace. In addition, those investigators obtained moderate evidence that such improvement was achieved by the workplace making early contact with the absent employee, ergonomic work site visits, and the presence of a RTW coordinator.

It is also possible that the content of the interventions in the 10 RCTs we analysed did not properly target the problems that the workers had. Can the variety in the content of workplace interventions (discussed in section 6.1.1) explain why the results of different studies vary so widely. This possibility needs to be explored further.

The determinants of sick leave are complex. Any attempt to understand them must take into account interactions between individual and environmental factors and how tasks are executed [18-20] over a large variety of occupations. Therefore, effective interventions may represent a combination of processes that require interaction between employees, employers, health professionals, and the employment system [21]. With the growing evidence base supporting RTW workplace interventions, should we consider whether there ought to be more interaction between RTW-workplace interventions and RTW-clinical interventions when designing new, more efficient workplace interventions? Guidelines for dealing with musculoskeletal disorders include most often measures aimed at symptom reduction, and therefore do not offer many recommendations for workplace interventions [22].

A challenging but necessary task for the future will be to implement effective organizational and collaborative workplace interventions for those who stay on the job despite being in pain.

Another explanation for the observed disparities might be that the groups targeted by the interventions were not the same in the studies included in our review as in investigations that have found positive effects of workplace interventions. In the literature reporting positive results of such interventions [8, 16, 17, 23, 24], the target groups were mostly employees on sick leave, and often those on long-term leave (different durations). Many of the people in the indicated target groups also had prolonged or chronic musculoskeletal disorders, or common mental disorders, whereas the subjects in our review were chiefly office workers with neck and sometimes also shoulder pain, few of whom were on sick leave. This finding implies that workplace interventions might be more effective for reducing sick leave rates than for relieving symptoms such as pain, a suggestion that is supported by another Cochrane review

focused on workplace interventions for preventing work disability [8]. They found that, compared to ordinary care, workplace interventions could reduce sick leave but did not affect health outcomes. Four studies provided moderate quality evidence for the outcome “time until first RTW” in workers with musculoskeletal disorders. In contrast, few of the workers in our 10 RCTs were off sick, and only three of the RCTs assessed sick leave as an outcome. This means that our review did not have the premises to expect conclusive results in the form of sick leave reduction.

In another review including 31 studies of 28 different workplace interventions aimed at reducing low back pain [25], it was found that only exercise had a documented effect on sick leave, and multidisciplinary interventions had an impact on pain. The authors of this review claimed that their results showed that there was a good reason to be careful when considering workplace interventions aiming to prevent low back pain among employees. If workplace interventions are mostly unsuccessful in reducing pain and more often effective in promoting work participation, this might be important when applying these very common interventions. Further high quality studies are needed to compare these two outcome measures.

5.1.4 Challenges in evidence-based decision making

The objective of study III was to reveal challenges in translating scientific knowledge into intervention decisions in the RTW process, and to suggest possible solutions to these challenges. The main goal was to obtain a deeper understanding of the EBP translation process by using the recognized components that are available to perform EBP. In a way, study V was part of the delivery chain for EBP, because it produced a systematic review that can be used in this decision-making in practice.

Since the end of the 1990s, EBP has been an increasingly prevailing paradigm in the health services. The perspectives arising from EBP also stimulate countless inspiring discussions about ontology, epistemology, and methodology in a real and complicated context such as the workplace. There are many challenges in the associations between individuals on long-term sick leave (often complex cases), the workplace, and various actors and stakeholders such as health care personnel. One such perspective is the need for tailored interventions to deal with decisions about individuals on sick leave.

Even though the rehabilitation professional in the hypothetical case study were confident in implementing EBP, she encountered both technical challenges as well as more fundamental or normative challenges. In general, forcing the EBP steps created a decision process that was limited to producing valuable and important knowledge from one type of literature (guidelines, systematic reviews, and RCTs). All other types of knowledge needed for decision-making were not an output of forcing the EBP steps and using the PICO framework. It seems that the patient’s knowledge and preferences and the professional’s expertise are taken for granted and thereby under-communicated by these tools. Sestini [177] has argued that the EBP process is based on Popper’s criterion of falsification, objective knowledge, and absolute truth. Porzolt et al. [185] reported that when these EBP steps were used in training of medical students, the teachers noticed a growing reluctance of the students to accept this strategy as they progressed in their education. Even though EBP facilitators advocate that EBP

represents more than guidelines, systematic reviews, and RCTs, it seems that we need a better strategy for integrating scientific evidence with expertise and patient knowledge. It is frequently assumed that the practitioner can apply scientific evidence to a real patient directly and literally, without any further effort, as if by magic providing the answer to what intervention should be used in that particular case. EBP often supports a “copy-and-paste” action rather than a demanding process, and it becomes confused if this is not actually possible. As Erikson claimed [274], EBP will never work in the field of human services. Considering practices from the perspective of episteme, rather than phronesis, is not to view them as actual practices, but only as general characterizations of practices.

Our hypothetical case study shows that the goal of the intervention appears to decide the role of evidence, and it also appears that the complexity of interventions, together with the aim of those measures, has an impact on the translation process.

While the Cochrane Collaboration is working hard to ensure the quality of scientific work, we might stop to wonder if we have got lost in translation and need a map [203]. It might also be commonly believed that EBP gives easy answers, whereas in real life this process often raises new questions. At the same time, we have also experienced that scientific knowledge from systematic reviews and RCTs has contributed new perspectives that have unquestionably had a positive impact on the insight of the practitioners. The challenges revealed by the present research suggest that we should differentiate more extensively between different types of evidence that come from interventions with a preventive, curative, or rehabilitative aim. Furthermore, this study that we should distinguish between evidence that is useful only for inspiring the intervention decision and evidence that is useful for determining the intervention decision.

The current Cochrane review (study V) identified a need for more high quality RCTs, but can such trials really aid decision making performed in complex contexts? The lack of differentiating the role of evidence in decision making might have led to overestimation of the importance of RCTs in intervention research. When adapting experimental design to decisions in complex cases, the contexts will surely influence the outcome. If scientific knowledge is to inform and inspire decisions, rather than determine them, different types of intervention research might become more valued than they are today. For example, a single case study reporting in detail a treatment that was successful for one patient could inspire and inform, and in this manner influence the intervention decision in a positive way. It would be easier to interpret case studies as informative, because they would not “pretend” to have a determinative role that should be directly transformed into intervention decisions in specific cases. The quality of the investigations is the main concern for the future, and, for example, it has been claimed by Rosen that high quality observational studies almost always provide results that are equivalent to those obtained in RCTs.

Study III revealed that there is no “quick fix” in complex practice, and that we need to reconsider the role of scientific evidence in intervention decisions. If this is true, then there is a strong need to explore decision making as a phenomenon and focus not only on whether it works, but also on how, when, and why a positive change occurs in the life of the clients. Miles and colleagues [275] have asserted that evidence-based

medicine is losing its influence, while the promise and potential of personalized medicine are being increasingly recognized. The development of decision making in the field of workplace rehabilitation should include the role of scientific evidence in high quality intervention decisions, although this requires further discussion. By focusing too extensively on maximizing the percentage of patients who benefit from care according to current scientific evidence [176, 188, 276], we tend to forget that, in specific cases, other types of knowledge might be superior to scientific evidence when all the available information has been appraised.

5.2 METHODOLOGICAL CONSIDERATIONS

5.2.1 The case studies using content analysis

5.2.1.1 Investigation of 30 employees on sick leave (studies I and II)

Some considerations about the sample are necessary. A limitation of study I was the lack of knowledge about non-responders and the fact that we were not permitted to obtain information about all the employees who were invited to participate. To ensure anonymity, the Ethics Committee in Medical Research did not allow us to ask for the reasons why potential subjects decided not to participate in the study. Therefore, we were unable to give descriptions of those who declined to take part.

The informants in study II were eight employees selected among the 30 workers on sick leave who were included in study I. The selection criteria stipulated that the individuals had to have musculoskeletal disorders, and they also had to be employed within a specific group of occupations in a certain type of organization, namely, human services with histories and experiences that might be relevant for all workers in such organizations. This means that it might not be possible to generalize the results concerning work demands to other types of health conditions and sectors.

These two studies focused explicitly on the employees' and supervisors experiences of leadership qualities and work demands, and the data were collected in qualitative interviews. The strength of this method lies mainly in its capacity to generate a wide range of descriptions, which helps to explore diversity [277] and also provides an internal validation of the results through unaltered quotations that represent the employees' authentic voices. The articulated experiences of the informants are not necessarily those used in practice, and this is a general risk in all studies in which the results are reported rather than observed. The reliability of our informants depended on how well they understood the questions and how much they believed that their confidentiality would be maintained [277], especially considering that they had been recruited through their company. The informants were allowed to choose where the interviews were to be conducted, which gave them some degree of co-determination. It has been shown that qualitative interviews are strongly influenced by the relationship that evolves between the interviewer and informant [229], and hence it was considered an advantage to use more than one interviewer with different strengths and weaknesses (to complement each other). To ensure that the voices were as authentic as possible, any laughter, crying, hesitations, and strong outbursts were noted in the texts during the transcription process. Analyses were discussed and executed in cooperation involving

at least two of the researchers. Any disagreement was discussed with close reference to the texts, and, if it persisted, an additional researcher was consulted.

Content analysis is often used [209, 217, 221-223] in projects that apply both qualitative and quantitative techniques. In that way it is similar to case study methodology [216, 219, 220, 278], which makes it easy to combine the two methods. In studies I and II, the first phase of the analysis was qualitative, with the aim of exploring new terminology of the phenomenon under investigation. The qualitative results from this work need to be explored and replicated in other sectors and branches. The seven leadership types in study I were constructed qualitatively by face similarity, and factor analysis must be performed in a larger quantitative investigation to ascertain whether these are indeed seven different types.

Counting meaning units is often done in content analysis, simply to be able to raise a hypothesis concerning possible connections and patterns, which must be further explored in larger, representative surveys [222, 223]. Statistical generalization is neither desired nor possible, since the sample is not representative of a population. Therefore, counting informants does not provide valuable knowledge. Despite the need to substantiate our results, theoretical generalization can be suitable and of interest. Another limitation regarding generalization is the extent to which our observations made in Norway are relevant in other parts of the world. The interaction between subordinates on sick leave and their supervisors is a universal topic concerning human relations, and the same applies to work demands, even though these might be highly influenced by the structure and culture in working life. It might be claimed that the culture in companies is informal in Norway compared to other Western societies, and the Nordic model of the tripartite cooperation between the unions, employers and government might influence the relationship between subordinates and supervisors. Still, most of the present results might be relevant for other Western countries as well.

5.2.1.2 The hypothetical single case study

The design of study III was original, and thereby challenging. It did not use traditional case study methodology, nor did it lead to a case study report. The referees for the publishing journal referred to the methodology as being innovative. Even though the entire case study was hypothetical, it did include several “real” components. The case was constructed based on core characteristics of 30 employees on long-term sick leave. The EBP steps, the PICO approach, and all the scientific evidence from the RCTs was authentic, although the 10 challenges were revealed through a theoretical analytical process. Nevertheless, it seems that the results and findings can be generalized theoretically, and they should be looked upon as a hypothesis that must be further explored and tested empirically in larger scale representative studies.

5.2.1.3 The case study of 12 municipalities (study IV)

This case study used both data from interviews and documents, and since such sources of information can be supplementary, data triangulation represents a potential strength. A possible limitation of this investigation is that only 12 organizations were included. That number is too small to represent true inter-organizational variation, which might reduce the external validity. Another potential weakness concerns whether the

documents and interviews actually reported all interventions that were planned or implemented. The level of intervention reporting is an additional problem when using this type of data; here, some interventions were reported merely on a broad level, as headlines, whereas others were described in detail. This is also a problem when quantifying meaning units. Still, in our data, it seems that this inequality was spread between the different types of interventions and between the organizations, and thus it did not represent a systematic misalignment. Two interviews were not taped and transcribed, and therefore we had to analyse written memos; this might have reduced the level of detail in the descriptions provided by the participants in these two focus group sessions. The cases used in this study were selected by three government offices and the employer organization, not by the researchers. However, inasmuch as heterogenic inclusion strategies were chosen, we do not regard this as a potential bias in this type of research. The sample was not recognized and presented as being representative.

New investigations might not give diverse results on the highest levels of the terminology developed in this study, which were as follows: level 1, intervention types (e.g., organizational and employee workplace interventions); level 2, intervention groups (e.g., information and education, adaptations, RTW programs). Theoretical generalization on these levels might be possible, although further investigations in other cultures, sectors, and branches will probably contribute to more diversity on the lowest level (level 3) called intervention descriptions.

5.2.2 The Cochrane systematic review

The GRADE analyses revealed that these studies provided mainly low quality evidence, which means that further research will very likely have an important impact on the confidence in the estimate of effect, and will probably change the estimate. As expected, blinding is a challenge in this type of research, and, due to the nature of these interventions, it is not possible to blind health care providers or participants. Thus it is impossible to avoid any influence that their expectations might have on the effect of the interventions. However, there should be nothing to prohibit blinding of the outcome assessor, but, despite that, less than 50% of the studies provided blinded outcome evaluation. Incomplete outcome data, low compliance and differences in baseline characteristics of the participants also introduced a high risk of bias in several of the included studies. The number of participants in each intervention was low in several of the investigations. In addition, the diversity of settings, participants, and interventions hampered pooling of data and the overall robustness of the evidence gained from results repeated across studies. Furthermore, the diversity of primary studies regarding interventions and outcomes represents a typical challenge to conducting meta-analyses of workplace interventions in general [279].

A limitation in using sick leave as a main outcome in our material was that few of the participants in the ten studies were on sick leave. Thus the significant results regarding sick leave were promising, considering that a study by Haukka and colleagues [248] had a low risk of bias and also used a broad four-component intervention based on evidence from participatory ergonomics methodology with high involvement of stakeholders [50, 93, 98, 99]. Nonetheless, two methodological limitations of our findings require

discussion. First, the outcome prevalence of musculoskeletal sick leave past three months was used to measure sick leave. The significant results at six-month follow-up showed that 28 of 216 employees in the intervention group and 41 of the 196 in the control group had had one or several days of this type of sick leave during the past three months. Separating musculoskeletal sick leave from sick leave for other reasons can be a complicated task, especially because the choice of not going to work is affected by many different aspects simultaneously [49], and also because of comorbidity. Another limitation concerns counting events for only the previous three months, which might also have restricted the results. This outcome measure does not show the numbers of days or hours these persons were off sick. If, for example, days or hours lost during the whole period from baseline to six months had been cumulated, the results would have been more valid, if the aim was to know how to prevent sick leave. These observations were made in a study of kitchen workers, whereas most workplace interventions targeting neck pain concern computer workers, and this may further reduce the clinical relevance and generalizability of the results.

There is no universally accepted definition of workplace interventions. In the present review, the main prerequisite was that an intervention was conducted in the workplace. Obviously, interventions that aim to modify physical or social and attitudinal factors in the work environment cannot be applied elsewhere. However, it can be feasible to conduct modification of personal factors such as exercise and other health promotion activities outside the workplace. It appears that no studies have been performed to compare the effectiveness of interventions across the settings, that is, both within and outside the workplace.

Our inclusion criteria stipulating that at least 50% of the participants in both the intervention and control groups were to have had neck pain at baseline represents another potential source of bias. Would the results have been different if the review had included only studies in which all or 75% of the participants had neck pain at baseline? Even though some of these investigations included only participants with neck pain, some of the subjects had not had such discomfort at baseline due to the fluctuating nature of neck pain.

6 CONCLUSIONS

The results reported in this thesis revealed substantial variability in the terminology related to leadership qualities, work demands, and workplace interventions, and this finding might contribute to more in-depth understanding of sick leave prevention and RTW at the workplace.

One of the present investigations identified a wide spectrum of *leadership qualities* that were valued by employees on sick leave and their supervisors, and the qualities considered to be valuable differed between those two groups of actors.

Another study showed that eight public sector employees on long-term sick leave due to musculoskeletal problems experienced that *demands at work* were mostly cognitive and emotional in nature, and they felt that they themselves were the ones who made the demands.

A third study demonstrated that actors in twelve municipalities mainly described *workplace interventions* that targeted organizational systems, processes, and culture aimed at reducing sick leave rates. There was large variation in the interventions that were implemented. Workplace interventions targeted single or groups of employees were more seldom described. The current review showed that there is still only limited knowledge about the effectiveness of workplace interventions. Overall, this investigation found low quality evidence that neither supported nor refuted any beneficial effects of specific workplace interventions with regard to pain relief. In addition, there was moderate quality evidence that a multiple-component intervention reduced sickness absence in the intermediate term, but this was not sustained over time.

It was a challenge to try to use evidence from randomized controlled trials in the RTW process, and the results call for new EBP approaches to translate evidence into decisions concerning complex workplace interventions. In general, it seemed that the EBP steps and the PICO framework constructed a confined decision process. Furthermore, the evidence apparently differed depending on whether the interventions were aimed at prevention, cure, or rehabilitation. Moreover, it seemed that some evidence originated from “good-for-all” interventions, and some arose from “tailored-type” interventions. These observations show that there is a need to differentiate the roles of evidence from different sources, considering whether it inspires, challenges, enlightens, informs, or determines the intervention decision.

7 IMPLICATIONS FOR PRACTICE AND RESEARCH

The results of these five studies have implications for both further research and innovation, as well as for practice and education.

It is likely that having more in-depth knowledge about organizational workplace interventions can be important for workplace actors, social insurance personnel, general practitioners, occupational physicians, and other occupational health care professionals. Further research should be more distinct as to whether the objective of the interventions is to reduce symptoms, to prevent sick leave, or to promote RTW. It is also essential to distinguish between organizational and employee workplace interventions, and it might be advisable to find a balance between those two types of interventions in practice, since they seem to interfere with each other. We should also conduct more studies in which clinical and workplace RTW interventions are combined.

To be able to capture the phenomena of leadership qualities, work demands, and workplace interventions in deductive research, it is necessary to use dimensions and variables that cover relevant aspects. Such aspects might be revealed empirically by inductive research, as described in this thesis. Perhaps the 78 new variables of leadership qualities, the 53 variables of work demands, and the 306 workplace intervention descriptions presented here can be used to define items included in new instruments. The current results provide a good starting point for improving the insight into the correlation between workplace aspects and sick leave duration. Our findings might also be used to develop new feedback approaches between supervisors and subordinates in order to raise awareness regarding both needs and solutions. Flexible approaches will probably be needed to tailor approaches so that they are consistent with the high variability of individual needs and contextual conditions.

These explorative studies revealed renewed possibilities for translation and implementation of science into practice. The oldest and most frequently used translational method is to perform randomized controlled trials, systematize them into reviews, and implement them in practice. This is a useful way of putting science into practice. Still, the three explorative investigations in this thesis (studies I, II, and IV) provide other possibilities for that purpose. The results might enable exploration of new variables, or even application of renewed terminology to examine known variables, such as employer-provided workplace interventions or the impact of leadership on sick leave. Another example is a new possibility of studying combinations of workplace aspects and their effects on sick leave by targeting structures, cultures, processes, and persons at the workplace. New knowledge might also contribute to a change in practice, for instance regarding what workplace interventions are actually provided. The current results may also prove useful as a basis for developing novel evidence-based methods to achieve support and follow-up of employees on sick leave, such as a web portal presenting evidence from science, supervisor-employee feedback evaluations, checklists for interventions, and other sources. The findings also indicate the importance of broadening the perspective of workers who are absent due to musculoskeletal disorders. Therefore, occupational rehabilitation should include all categories of demands existing within specific occupations.

Disability management [25, 26, 28, 280] has been described and developed as an international field of research and practice, and it is an employer-based strategy aimed at successful job maintenance or optimum timing for RTW among persons with disabilities. The focus in this field has been on the competence needed when an employee's injuries prevent him/her from working. Several countries have joined the international efforts concerning certification of disability management professionals and RTW coordinators [149, 165, 281]. These professionals are not intended to replace supervisors, but rather to support supervisors and their subordinates, for example, when identifying work demands and choosing workplace interventions in the RTW process in the workplace. As more professional advisors become involved in the RTW actions, it is possible that some of the leadership qualities reported here will be possessed by people other than immediate supervisors, or that they will make the RTW coordinators of educational programmes aware of the needs of people on sick leave.

Until now, there has been a lack of rigorous experimental research assessing the effectiveness of organizational workplace interventions, and such efforts might be easier by the insight into the complexity of these types of interventions that is provided here. It is also clear that there is an urgent need for high quality RCTs studying well-designed workplace interventions. According to the results of the present Cochrane systematic review, further research is very likely to have a pronounced impact on our confidence in the estimate of effects, and it will probably also change the estimate.

To be able to ensure better implementation of intervention programme in the future, it is also crucial that implementation science more often be linked to implementation practice. According to the PARiHS framework [206, 207, 282], it seems that the national sick leave reduction programme initiated in Norway (study IV) lost one of the *three components* (evidence, context, and facilitation) that is essential for successful implementation. In short, the *evidence* documenting what workplace interventions should be implemented by the municipalities was not clearly presented in this programme. Also the new model of EBP steps suggested in study IV might be of value in this context. The national programme also lacked the presence of a researcher as a collaborator and implementation *facilitator*. Implementing workplace interventions in an evidence-based strategy that requires continuous dialogue and collaboration with researchers during the entire process. The researcher's role is to provide relevant evidence, to discuss the knowledge base for choosing interventions, and to help design and evaluate implementation of evidence-based workplace interventions. By using of audit and feedback, social interactions and dialog has been showed to be effective to increase the evidence uptake in practice. Evaluations of complex interventions should also include more detailed planning and reporting of the implementation per se in new *contexts*, and consider how to measure the quality of implementation process [272].

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*In memory of my dear father Kåre Aas,
who taught me to meet demanding tasks
with hard work.*

ABSTRACT

Background: Earlier research has revealed risk factors for sick leave in the workplace, and thus the workplace has become an important arena for sick leave prevention and return to work (RTW). Despite that, some of these aspects have received little attention in exploratory studies. Simultaneously, there is a need to translate and implement the growing knowledge base in this field in order to develop evidence-based practice (EBP).

Aim: The aim of the present research was to explore some aspects of workplace-based sick leave prevention and RTW, such as workplace interventions (studies III, IV, and the appendix), leadership qualities (study I), and work demands (study II), and also to reveal challenges to translating scientific knowledge into intervention decisions in the RTW process, and possible solutions to these challenges (study III).

Material and methods: Content analysis methods were applied on data from interview transcripts and documents. In addition, a Cochrane systematic review of the literature was conducted.

Results: *Study I* identified 78 distinct leadership qualities and seven leadership types ($n = 345$ meaning units) perceived by 30 employees on long-term sick leave and their immediate supervisors. The three most valued leadership qualities were “ability to make contact”, “being considerate”, and “being understanding”. The three most valued leadership types were the Protector, the Problem-Solver, and the Contact-Maker. The subordinates gave more descriptions of the Encourager and the Recognizer, whereas the supervisors most often described the Responsibility-Maker and the Problem-Solver. The combination of leadership types reported most frequently was the Protector together with the Problem-Solver.

In study II, eight employees on long-term sick leave due to musculoskeletal diseases and disorders described 51 work demands they had experienced. The demands were perceived in some cases as having only a negative or a positive impact on work performance, but in others as both. Only seven of the demands were physical in nature, and most involved emotional and cognitive challenges in mastering the work tasks. It was also experienced that most demands came from the employee ($n = 36$) and only a few from the employer/work environment ($n = 7$) or both those sources ($n = 8$).

Study III was a hypothetical case study aimed at revealing the challenges associated with translating scientific evidence into intervention decisions in the RTW process. This investigation was performed according to EBP frameworks. The evidence seemed to differ depending on whether it came from preventive, curative, or rehabilitative interventions. Moreover, it appeared that evidence in some cases originated from “good-for-all” interventions but in others from “tailored-type” interventions. Thus, a need to differentiate the roles of evidence was revealed in terms of whether it inspired, challenged, enlightened, informed, or determined the intervention decision. In general, the evidence-based framework seemed to construct a confined decision process. Possible solutions, and revised EBP steps were suggested.

In study IV, 15 workplace interventions were identified ($n = 306$ meaning units), which were intended to reduce sick leave rates in 12 municipalities. The interventions were divided into two groups according to their targets in the organizations: nine organizational-workplace interventions targeted structures, processes, and culture ($n = 220$ descriptions, 72%); six employee-workplace interventions targeted persons ($n = 86$ descriptions, 28%). Examples of organizational-workplace interventions were developing routines/systems, establishing cooperation/ collaboration, providing information/education, building culture/anchoring, and recruiting/staffing. Employee-workplace interventions involved well-being/lifestyle interventions, physical activity/exercise, redeployment, adaptation, follow-up of employees on sick leave, and RTW programmes. The intervention profiles varied considerably between the municipalities.

*In the appendix (study V), a Cochrane systematic review of the literature was conducted to reveal the content and effectiveness of workplace interventions for employees with neck pain. Of 1,995 references found, 10 randomized controlled trials (RCTs) were included. Two of the RCTs had low risk of bias, and eight of them examined office workers. Few were on sick leave. Only three of the ten studies assessed the outcome of sick leave. The workplace interventions varied considerably regarding complexity and content. Overall, evidence was of low quality and showed no significant impact of workplace interventions on *pain reduction* (seven RCTs, 2,368 workers). Furthermore, one RCT, with 415 workers revealed that workplace interventions were significantly more effective in *reducing sick leave* in the intermediate term (OR 0.56, 95% CI 0.33–0.95), but not in the short or the long term.*

Conclusions: The results reported in this thesis revealed a variety of terminology related to workplace interventions, leadership qualities, and work demands, which might contribute to more in-depth understanding of sick leave prevention and RTW at workplaces. It was a challenge to trying to use evidence from randomized controlled trials in the RTW process, and the results call for new EBP approaches to translate evidence into decisions concerning complex workplace interventions. The current research also revealed that knowledge about the effectiveness of workplace interventions is still limited.

Key words: sick leave, sickness absence, return to work, workplace interventions, work demands, disability prevention, evidence-based practice, knowledge translation, implementation science, occupational rehabilitation, Rogaland RTW study.

LIST OF PUBLICATIONS

This thesis is based on the following studies, which are referred to in the text by their Roman numerals:

- I. Aas RW, Ellingsen KL, Lindøe P, Möller A. Leadership qualities in the return to work process: A content analysis. *Journal of Occupational Rehabilitation*; 2008,18:335-346.

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- II. Aas RW Thingbø C, Holte KA, Lie K, Lode IA. On long-term sick leave due to musculoskeletal diseases and disorders. Experiences of work demands. *Work. A Journal of Prevention, Assessment and Rehabilitation*. In press 2011.

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- III. Aas RW, Alexanderson K. Challenging evidence-based decision making. A hypothetical case study about return to work. *Occupational Therapy International*. In press 2011.

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- IV. Aas RW, Möller A, Loisel P, Alexanderson K. A governmental initiated programme to reduce sick leave in Norway: Identifying the workplace interventions. Submitted 2011.
- Appendix (V) Aas RW, Tuntland H, Holte KA, Røe C, Lund T, Marklund S, Möller A. Workplace interventions for neck pain in workers. *Cochrane Database of Systematic Reviews*. 2011, Issue 4, Art. No. CD008160. DOI:10.1002/14651858.CD008160.pub2.

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LIST OF ABBREVIATIONS

CI	confidence interval
EBP	evidence-based practice
ICD-10	WHO's International Statistical Classification of Diseases and Related Health Problems. Tenth revision.
ICF	WHO's International Classification of Functioning, Disability, and Health
MD	mean difference
OR	odds ratio
PICO	PICO stands for patient, intervention, co-intervention, and outcome
RCT	randomized controlled trial
RTW	return to work
WHO	World Health Organization
WI	workplace intervention

PREFACE

I first met the field of occupational health more than 20 years ago, at which time I was in the middle of my bachelor's education in occupational therapy. It was challenging to learn about the efforts that companies were making to identify and remove risk factors for health problems in the work environment. I remember thinking that this field would be my future speciality. The data for my bachelor's thesis was collected in occupational health services in Copenhagen in 1990, and this included visits to actual workplaces, which made a strong impression on me. We went to a brewery and a telecom company to observe how the employees performed their work in a real context and how adjustments were made to prevent health consequences. At that time the focus was not on preventing sick leave and promoting return to work (RTW), but rather on disease prevention.

After working in a paediatric clinic and in public health care for five years, my interest in workplace-based issues again entered my thoughts. Therefore, I started the company Ergokompetanse, providing occupational health advises at worksites. During this period, I increasingly asked those I met in workplaces about employees who were on sick leave; I did not see them, and they were seldom mentioned. In the late 1990s, I also became interested in evidence-based practice (EBP) and started to provide courses on this topic for health care personnel. Documentation of effectiveness of interventions was a challenging task. At the same time, my engagement in the World Health Organization (WHO) classification of functioning (then called ICIDH, redesignated ICF in 2001) became more extensive, and I joined the national reference group in the Directorate of Health in 2003. My master's thesis in health sciences at the University of Oslo in 2002 focused on describing the functioning of a patient group by using ICF terminology. As a researcher, I gradually saw new potential in applying this terminology, particularly to help describe and clarify what the sick leave and RTW interventions were targeting, that is, what they tried to solve.

My concern slowly grew about whether all disease-preventing interventions implemented at workplaces were actually providing results, and whether these efforts had an impact on sick leave and RTW. I more often questioned whether the same measures used in disease prevention, also were useful for sick leave prevention. Furthermore, I experienced that sick leave was the only "intervention" being used, even though it did not seem to solve the employees' problems. The articles published by Patrick Loisel and colleagues at Sherbrook University in Canada gave me new perspectives on an aspect of this field that those investigators called a paradigm shift from disease prevention to disability prevention. While working to improve the effectiveness of workplace interventions, I also wondered if our intervention research was really able to capture the complex features of the workplace that are relevant to sick leave prevention and RTW. In addition, I became more concerned about whether the courses I held in EBP were indeed helping to put science into practice. My enthusiasm was awakened when I discovered the literature describing knowledge translation and implementation science, and more importantly, this discovery led to the establishment of PreSenter, a new research and knowledge translation centre focused on sick leave, inclusion, and RTW.

When I participated in a PhD course on sickness absence research at Karolinska Institutet, I came in contact with a research environment that was conducive to learning and understanding more about the complex phenomenon of sick leave. This also gave me the opportunity to become familiar with applying the categories of studies on sickness absence suggested by the Swedish Council on Technology Assessment in Health Care (SBU) [1]. In Table 1, these categories are used to present an overview of the topics included in my thesis.

Table 1. Categories for studies of sickness absence

Focus of the study	Scientific discipline	Perspective taken	Structural level of the factors included in the empirical analyses
- Risk factors for sickness absence	Medicine	Society	Individual
- Factors affecting return to work	Health Sciences	Local society	Family
-Consequences of being on sick leave	Sociology	Insurance	Workplace
- Sickness certification practice	Psychology	Health services	Organization
	Economics	Physicians	Community
	Law	Employers	National
	Public health	Sickness absentees	International
	History		
	Philosophy		
	Management		
	Anthropology		

Note: The categories most relevant to the subject of this thesis are indicated in bold type.

I feel that one of the current challenges in this research field is that we do not know what interventions are being applied at workplaces. I believe this calls for “black box research”, such as exploratory inductive investigations. By exploring the experiences of different types of actors and stakeholders, we might gain new in-depth knowledge on what really happens at workplaces. For instance, the variability in workplace interventions might concern the content, the provision, the progress, the dose, the actors, the competence of the provider, and the contextual factors related to the type of measures used, but it might also be associated with how the interventions are implemented in new contexts. In order to be able to design workplace interventions that are more targeted and precise, the main objective of my research has been to explore workplace aspects in greater detail. It is possible that more focused workplace-based efforts made in the future will contribute to prevention of sick leave and to more sustainable RTW, and thereby lower the costs of sickness absence and the burdens on employees, employers, and society as a whole.

Personally, I feel it is exciting that the issues of *sick leave*, *RTW*, *workplace interventions*, *EBP*, *intervention research*, *knowledge translation*, and the *ICF* have followed me for over two decades, and that they have more or less been incidentally unified in this thesis. Still, I believe that these issues will also induce me to struggle with new questions and concerns for the future.

1 BACKGROUND

1.1 SOCIETAL AND POLITICAL CONTEXT

To understand measures to prevent unnecessary sick leave (from here on called sick-leave prevention) and promote return to work (RTW), it is essential to contextualize these phenomena. Generally speaking, several contextual factors are important when attempting to understand sick leave in a society. The employment rate in Norway is the highest in Europe, on average 10% above than the mean level in the countries of the European Union [2]. One reason for this is the large number of women in gainful employment in Norway, representing a level 13% higher than the mean rate in the European Union. Furthermore, both younger (ages 15–24 years) and older (ages 55–64 years) people in Norway participated in the labour market to a greater extent than seen on average in other European countries. The picture is essentially the same in Denmark and Sweden [2].

The way that sick leave is viewed and solved in a given society can also be explained from a historical viewpoint. The given empirical context for this thesis is Norway, and hence the text presents the historical background of the prevention of sick leave and promotion of RTW at workplaces in this country. Here, these are divided into three epochs, which I have chosen to call the *initial era* before 1989, the *working-line era* of the 1990s, and the *inclusive working life era* of the 2000s.

1.1.1 The initial era before 1989

As early as 1911, the first law concerning sickness benefits for employees with the lowest income was enacted in Norway [3]. In 1974 the sickness benefit system was integrated into the National Social Insurance (Folketrygden), and in 1978 the current benefit system with full compensation for people on sick leave was added [3]. A growing tendency towards more people being on long-term sick leave and disability pension had already emerged in the 1980s. This fact became important for what happened in the 1990s, when a parliamentary resolution adopted in 1988 strengthened the follow-up of people on long-term sick leave (> 8 weeks) [4]. Two different initiatives were introduced: (1) what are known as the basic groups in all municipalities, which were to try to find possible interventions to get people back to work more quickly after sick leave; (2) a new medical certificate for sick leave lasting longer than eight weeks.

1.1.2 The working-line era of 1990–1999

In Norway, what is known as the “working line” was strengthened in the 1990s. Both the disability [5] and sick leave [4] benefit systems were investigated on a national level to ascertain why the costs of sick leave and disability had increased, and to find a way to reduce the expenditures in that context. One proposal was to give the employers more responsibility for performing workplace assessments of employees with prolonged or frequent periods of sick leave [4]. In 1991, the employers’ organization NHO and the union LO started a three-year project in some sectors of industry that was aimed at reducing sick leave rates in the 400 participating companies. The evaluation

report revealed a 15% reduction in sick leave over the whole period [6]. Another study in this project revealed that three types of workplace efforts contributed to prevention of sick leave and lowering of sick leave rates: developing the working environment, providing good routines for early detection of those in risk of being sick listed, and having high quality follow-up of employees taking sick leave [7-9]. The project also showed that, within the participating companies, there were obstacles to uncovering sickness among the employees and to bringing those on sick leave back to work [8]. Two years later, the success of this two-party sick leave project was also stressed in the White Paper on Welfare [10]. The cooperation between the employee and employer organizations was considered to be particularly valuable, and the government wanted to use this model as a basis for their policy and also spread the results to other branches, especially the public services.

In 1994 a large experimental programme was initiated by the Social and Health Ministry [11] and carried out by the National Social Security Office (Rikstrygdeverket). The aim was to try new workplace interventions that were intended to prevent and reduce sick leave. In the evaluation of this programme in 2000, the projects that had focused on the follow-up of sick leave could be sorted into three models, which were referred to as “the company model”, “social insurance model I”, and “social insurance model II”. In the first model, the employer did everything possible to find interventions for employees on sick leave before contacting the social insurance office. In the other two models, the social insurance office was in charge of the process of bringing the employees back to work. The differences between social insurance models I and II were related to the level of contact with the workplace. These two models were considered most beneficial, because the actors experienced that they obtained better understanding of a sick leave case when they visited the workplace [11].

1.1.3 The inclusive working life era from 2000 onward

At the Lisbon meeting in 2000, the European Union Presidency agreed on a new strategy for employment in Europe involving introduction of a knowledge-based economy [12]. A central point in this strategy was the goal to strengthen the labour market within the Union: “*to regain the conditions for full employment*” [p. 2]. The goal of participation in the labour market was set to increase from 61% (in 2000) to 70% (in 2010). This was to be achieved in particular by establishing a flexible labour market with equal opportunities for all.

The same strategy was pursued in Norway within the Inclusive Working Life Agreement established in 2001 [13], which concurs with the Nordic welfare model [14]. This agreement was signed by the employer confederations and labour unions, as well as the government. The aim was to reduce the sick leave rates by 20%, to include more persons with disabilities, and to raise the retirement age. It could be claimed that a paradigm shift occurred in Norway regarding how follow-up of employees on sick leave should be conducted. The overall responsibility for handling sick leave was transferred from public authorities and health care to the employer [15] by use of arguments from the international trend of Corporate Social Responsibility [16]. This resulted in three changes on a national level: (1) the workplace became the main arena for both prevention of sick leave and rehabilitation of persons on sick leave; (2) the

employer and the employee became the core actors in finding interventions, and the other actors took on a support function and were called “the good helpers”; (3) a new ideology was implemented in which the focus was shifted from disease and problems to functioning and resources [11]. Today, there are as many as 49 different Inclusive Working Life interventions to prevent sick leave and promote RTW [17].

The tripartite agreement was also implemented on a local level, where all willing companies signed an Inclusive Working Life Agreement involving the employer, a local employee representative, and the social insurance office. Figures from the National Social Insurance show that approximately 1.2 million employees (i.e., more than half the workforce) were working at Inclusive Working Life companies (n = 44,000) in 2010 (www.nav.no). About 88–97% of public employees work at such companies, whereas the rate is only 15–20% (average 35%) in some branches of the private sector. One competence environment called a Working Life Centre was founded in each county included in the social insurance organisation. Becoming a Working Life company entailed several advantages, including economic aid and access to a contact person (advisor) from the Working Life Centre who could offer guidance in how to reduce sick leave. Evaluation showed that the companies were satisfied with the contact person and the help they received from the Working Life Centres [17-21].

In 2004, the role of the general practitioner (GP) was highlighted in an educational programme offered to all GPs. Almost half of the GPs participated [21]. The objective of the programme was to strengthen the supervisory role of GPs in relation to the workplace and the social insurance offices. A new sickness certificate was also developed, on which the GPs were to include a short report on the functioning of the person on sick leave. This initiative was also intended to promote the workplace as the main arena.

The Inclusive Working Life Agreement adopted in Norway in 2001 [22] heralded a new way of following up employees on sick leave. It meant that employers were to be responsible for that task, and workplaces were defined as the main arena for preventing sickness absence and promoting RTW. The employee on sick leave and his/her immediate supervisor became the core players, while the health care service and social insurance office¹ were to support those actors by being “good helpers”. This change in Norway corresponds to international trends, which have been communicated mainly through Corporate Social Responsibility [23] and Disability Management [24-29]. Notwithstanding, even today, ten years after inception of the Inclusive Working Life Agreement, there is only limited scientific knowledge about how to achieve sustainable RTW. Despite this, the impact of workplace aspects on prevention of unnecessary sick leave and RTW is seldom questioned [30-34].

The Sick Leave Committee led by Prime Minister Stoltenberg was established in 2006, with a mandate to propose and implement interventions aimed at reducing public expenditures related to sickness absence. The work done by this committee [35] resulted in a renewed system for follow-up of people on sick leave, including dialogue meetings, clarified roles of actors and intervention plans, more adaptations at

¹The Norwegian Labour and Welfare Administration is called NAV.

workplaces, and stronger employer commitments. However, the most costly intervention was to strengthen the treatment and rehabilitation of persons who are off sick, and hence the programme entitled “A Fast Return” (Raskere Tilbake) was born [36]. The goal of this initiative was to accomplish more rapid clarification, medical treatment, and rehabilitation in sick leave cases, circumventing the ordinary queues and budgets.

1.2 THE WORKPLACE

The workplace is the focus of this thesis. However, many different contexts are involved in the daily lives of individuals, and thus these might also play roles. In addition, it might be of interest to investigate research results regarding the impact of workplaces on sick leave prevention and promotion of RTW in order to enable evidence-based practice (EBP) and knowledge translation in this field. These topics are given further consideration in this chapter.

1.2.1 The workplace as the main arena

As mentioned, several premises have made the workplace a more focused arena for interventions. The responsibility for health and sick leave has gradually been transferred from the healthcare system to the employer. This has also been expressed through the model of Corporate Social Responsibilities, which, among other things, targets companies’ responsibilities for their own employees’ health and absence. Accordingly, new social policies and systems highlight a more spacious or inclusive working life [22], which anticipates involvement of the stakeholders and closer contact between the employees and employers [37]. An implication of this is that the workplace is a core intervention arena in Western health and social policy, and this development has been further expanded by promotion of the Disability Management movement [26]. Still, this arena needs to be seen viewed in relation to other contributing arenas. For example, contact between health care providers and the workplace actors has been looked upon as essential for RTW [38].

Several official documents in Norway have emphasized the importance of the workplace as the main arena for both prevention of and rehabilitation after sick leave. This is exemplified by the following [11]: “*The starting point is that interventions to reduce sick leave should be anchored at the workplace. This is true both for prevention of sick leave and the follow-up of sick listed employees.[....]. The workplace is the central arena for prevention*” [p. 142]. Another core official political document [39] included this statement: “*The workplace and working life are the most important arena for the inclusive working life politics. Interventions to prevent and to limit exclusion from the working life, and to promote inclusion should thereby as often as possible happen at and in connection to the workplace.*” [p. 171], and also “*Several of the main actions need to be seen in line with the cooperation between the government and working life actors for a more inclusive working life, where the basis is that the most important arena for inclusion is the workplace.*” [p. 169]. Thus, in Norway, the main arena for preventing sick leave and promoting RTW is according to legislation, the workplace.

The arenas consisting of employees' RTW after sick leave might be defined as comprising one main arena, two side arenas, and three life arenas (see Figure 1)[40]. The two side arenas are suggested to be the *health care* and the *social insurance office*, and the three life arenas might be *home*, *leisure*, and *society*. It is seldom possible to understand the problem of sick leave by focusing solely on one arena. Indeed, it is often necessary to see them simultaneously and in relation to each other. In addition, both the social insurance offices and health care services involve actors that are in the workplace providing several types of interventions for RTW. Examples of this are visits to worksites, workplace assessments, introducing adaptations, giving advice, and providing economic support for changes.

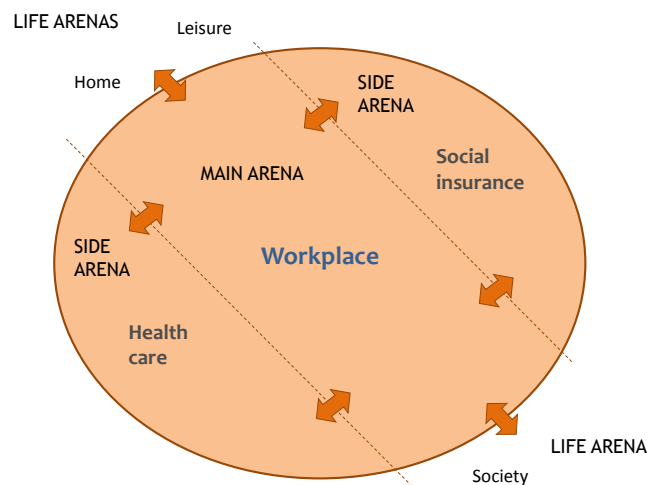


Figure 1. Main arena, side arenas, and life arenas for preventing unnecessary sick leave and promoting return to work

1.2.2 The workplace in the scientific literature

The scientific literature has also strengthened the emphasis on the workplace/worksite, or it has at least shown greater use of these terms, as illustrated by a search of the Medline database from 1980 onward. During the first twenty years of that period (1980–2000), an average of 0.7 more articles per year used the term *workplace* or *worksite* in the title, abstract, or key words, and that was raised to an average of 9.8 more articles per year after 2000. The top year of 2006, when 84 articles used *workplace/worksite*, might be regarded as promising for the scientific knowledge base on workplace-related sick leave efforts.

If the number of articles using the term *absenteeism* or *sick leave* increases, it seems natural that the number of articles mentioning *workplace/worksite* will also rise. Figure 2 takes this into account and gives the percent of the articles mentioning workplace/worksite in their title, abstract, or key words among all the articles coded with the MeSH terms *absenteeism* and *sick leave*. In 1980, only 1% of the articles mentioned *workplace/worksite*, whereas 17.6% did so in 2006. The diagram shows a steady increase since 1990, with *workplace/worksite* used four times more often in 2006 than in 1990, and more than twice as often in 2000 compared to 2006. This growth of the literature in this area might provide new possibilities to apply EBP in promoting return to the workplace among employees on sick leave.

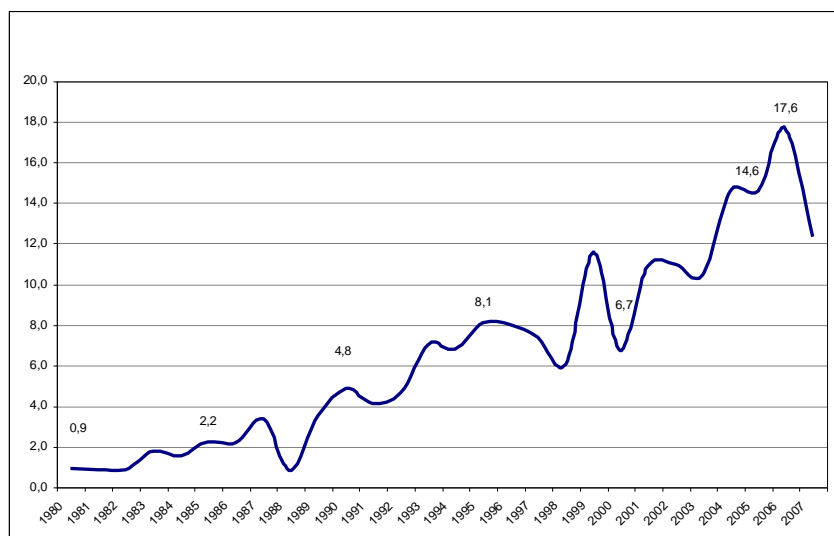


Figure 2. Percent of articles each year, from 1980 to 2008, using the term *worksite* or *workplace* in the title, abstract, or key words (n = 515), among all publications indexed in Medline with the MeSH terms *absenteeism* and *sick leave* (n = 7315). The search was performed in June 2008.

1.3 PERSPECTIVES AND CONCEPTS

Different perspectives are needed to understand what was investigated in the research underlying this thesis. In the present studies, all work environment aspects such as workplace interventions, leadership qualities, and work demands were considered to represent workplace-based efforts to reduce unwanted sick leave or promote RTW. Aspects of evidence-based practice, knowledge translation, and implementation science were also important perspectives in this research.

1.3.1 Sick leave

Sick leave is often regarded as a considerable problem in the working population, but at the same time it is associated with one of the most valued welfare schemes. Having economic security during sickness absence might constitute one of the most important safety nets for all employees, especially when a chronic health problem is involved. In Europe, Norway has historically been among the countries with the highest levels of

sick leave [1]. The rates of such absence vary widely between different sectors and businesses, and also between the sexes. For example, the rate is higher in the public than in the private sector. Of special interest in this thesis is the fact that the sick leave rates in the public sector have been particularly high in the municipalities; for example, in 2006 the rate was 7.7% compared to the national average of 5.8% [41] (i.e., a difference of 25%). Norway has 430 municipalities, which employ people primarily in health care, kindergartens, and schools, and there is a 75% predominance of female personnel. On average sick leave is two percentage points higher for women than for men (see Figure 3).

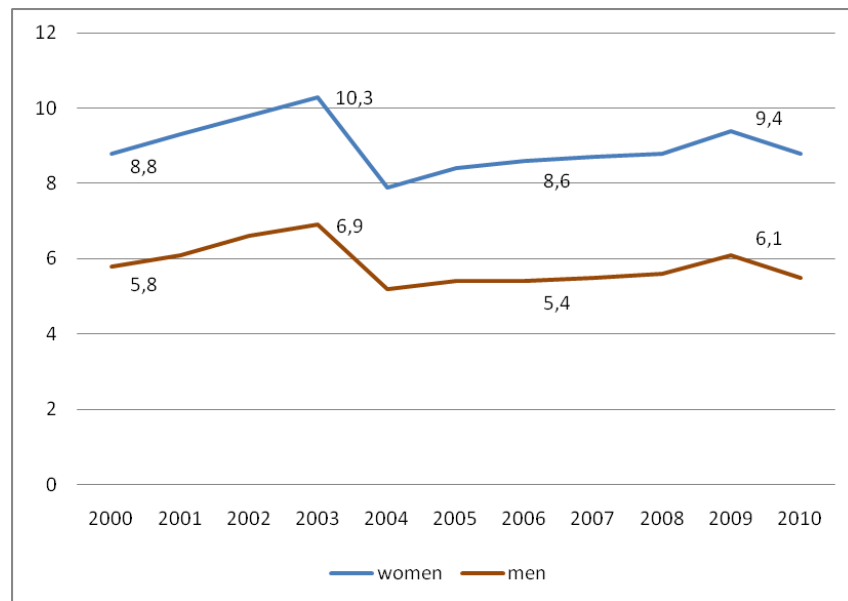


Figure 3. Total sick leave rates in Norway from 2000 to 2010 (percents of lost days). The data were obtained from the national sick leave statistics and represent only the fourth quarter of every year (data source: Statistics Norway).

There is no consensus on what should be regarded as long-term or short-term sick leave [42, 43]. In some investigations, these have been defined based on the sickness absence insurance scheme or the manner in which available data were collected. Nonetheless, in many studies, a period of eight weeks or 56 days or more has been considered long-term sick leave, especially in Norway and Denmark [42-48]. Some have also designated 59 days or more [43], and many other variants can be found in the literature, such as 21 or 28 days, or even 90 days or more [42, 43].

The sickness flexibility model [49] describes sick leave as a person's decision about whether or not to go to work. Several factors have an impact on this decision, such as the possibilities for adjustments and accommodations, the person's motivation in relation to demands and incitements, the health situation itself, and possibly also capacity or competence. This model makes the individual who is contemplating sick leave a core informant who provides a more in-depth understanding of the complex

decision to stay away from work, or the choice to go to work despite a current health problem.

At times it might be experienced as it appears that the reasons for sick leave are viewed as equivalent to the causes of our health problems [40]. This means that curing health problems will automatically reduce sick leave rates. It seems that it might be important to differentiate between those two concepts (i.e., sick leave and health problems), especially in the workplace. Even if a health condition cannot be cured, it might be possible for a person to stay on the job, if adaptations are made in the workplace, work tasks, and working hours. Such interventions have been proven effective for workers on long-term sick leave due to low back pain [50].

1.3.2 Work demands

Work or job demands have been defined in the literature as requirements set by the environment [51], and these can be detrimental if they are not balanced against job resources [52]. The most widely used theoretical model linking work demands to health is called the demand-control model [53-56]. The demands in this case refer to psychological demands, a dimension that comprises questions about how hard people work, organizational constraints on task completion, and conflicting demands. This model combines physiological demands with the level of control, and it sometimes includes physical demands as well [54]. The model was first used to address cardiovascular diseases [57] and later even for musculoskeletal disorders [53-55, 58-67]. Associations between job demands and sickness absence have also been found [68, 69]. However, little research has been done to examine the effects that job demands might have on RTW [65]. The demand-control model has been criticized for not being adapted to human service work [52, 70-72], and other perspectives might be relevant to understanding the demands and their complexity in the associated organizations.

The Model of Human Occupation [73], which was first described in 1985 [74], seeks to explain how occupation is motivated, patterned, and performed [75], and it may also be well suited for studying the relationship between job demands and occupational performance. This model is based on system theory and explains thinking, feeling, and doing as arising out of the interaction between internal components and the environment. The environment is divided into physical and social compartments, which offer several opportunities, resources, demands, and constraints. The way the environment influences behaviour depends on a person's values, interests, personal causation, roles, habits, and performance capacity. Interactions between humans and environments are affected by occupational participation, performance, and skills. Occupational participation is defined as engagement in work, play, or activities of daily living as part of one's socio-cultural context; it refers to doing an occupational form, and occupational skills are the observable, goal-directed actions of a person [73]. The Model of Human Occupation enables us to understand aspects of the disabled worker [76, 77].

It is possible that people experience and interpret work demands in different ways, depending on whether they are or are not on long-term sick leave. The expectations that individuals have of themselves, the expectations from the physical and social

environments, and also the content of the work tasks make disparate demands on employees. The lack of knowledge about how employees on long-term sick leave experience different work demands in the RTW process indicates the need for further studies. This knowledge is crucial for all stakeholders, including the employers, who are responsible for finding effective workplace interventions.

1.3.3 Leadership qualities

As already mentioned, the Sandman report [11] in 2000 and the subsequent Inclusive Working Life Agreement [22] defined the workplace as the main arena for follow-up activities and interventions. The immediate supervisor and the subordinate became the “core actors”, whilst the physician, health personnel, and others were considered “good helpers”. Thus, supervisors in Norway now provide services for prevention of sick leave and promotion of RTW. Therefore, it seems to be of interest to reveal if and how leadership research might explain this role more thoroughly, as well as the challenges involved in this task.

Leadership research has a long history. During the first half of the 20th century it was concentrated on mapping the personal traits of supervisors [78], and a programme on leadership at Ohio State University after World War II contributed to a new focus on the behaviour of supervisors [79]. Several studies have quantified leadership styles and behaviours, the most well known of which are the theories of transformational and transactional leadership [80-82], and task versus relation-/people-oriented leadership. Both these schools were criticized by a third direction—the situational and contingency theories of leadership—for not including situational dependency [83]. Situational theories focused on the interaction between the supervisor and the subordinate, and indicated that supervisors who are able to adjust to different situations are more effective. A literature review conducted in 2005 focused on the relationship between leadership and the health of subordinates [84]. The conclusion drawn in that work was that even though leadership is a well explored topic in the scientific literature, only a few studies have investigated the impact of leadership on subordinates, and even a smaller number have examined how leadership affects the health of subordinates. The authors of that review suggested that leadership is best studied indirectly through other variables, because supervisors have a large impact on factors such as the demands, control, and social support of subordinates, and these strongly influence employee health.

Previous studies have revealed that the risk of long-term sick leave increases with lower social support from the supervisor and with lower management quality. Management and leadership styles can greatly influence injuries, disability, and sick leave. An investigation performed in Denmark found that the risk of long-term sick leave (> 8 weeks) among 1,610 employees at 52 workplaces increased with reduced support from supervisors and lower management quality [46]. Also, a study in Finland showed that a lack of supervisor support for women and a lack of co-worker support for men increased the frequency of sick leave (> 21 days) among 3,895 employees in the private industrial sector [85]. In a study of the Norwegian oil industry, it was observed that the style of and trust in a manager constituted important factors predicting personal injuries, and also that there was a significant negative

correlation between confidence in management and sick leave [86]. Moreover, Halford and Cohen [87] revealed a significant association between managerial support and musculoskeletal symptoms in a self-reported interview-based survey among call-centre workers.

In many cases, an employee on long-term sick leave challenges leadership qualities. In a Swedish focus group study of 23 supervisors [88], the aim was to explore views on employers responsibility in the RTW process. It was found that the participating supervisors defined themselves as key persons who carried the main responsibility for the rehabilitation of employees on sick leave. This responsibility places special demands on supervisors, especially on their leadership qualities. This new leadership role has not been thoroughly described and defined, and many supervisors feel confused and unskilled in this important task. Furthermore, it is not yet clear what type of leadership is most valued by subordinates on long-term sick leave. Providing beneficial supervision might facilitate safe, sustainable, and fast RTW.

1.3.4 Workplace interventions

Since the 1990s, the workplace has gradually been recognised as a core arena for prevention of disease and disability [30, 89-91]. Therefore, workplace interventions are seen as crucial components in the efforts to reduce sick leave and promote RTW [37, 38, 92-95], which has sometimes, but not always, proven to be true [37, 38, 93-99]. How can this discrepancy be explained? A plausible answer is that all the studies have not used the same target group. Some have focused on healthy employees or risk groups, whereas others have targeted people who are on long-term sick leave due to chronic musculoskeletal disorders, and different intervention approaches are often required towards those groups. Also, the types of workplace interventions in the studies have varied widely. In many cases, when one study has demonstrated that workplace interventions are effective and another has shown the opposite, different workplace interventions have been in use [34, 93, 96]. In addition, there has been comprehensive involvement of stakeholders in some studies but not in others. Thus, research efforts have not really achieved an in-depth understanding of the variability of core workplace aspects that are important for preventing sick leave and promoting RTW. This questions the effectiveness of workplace interventions, and it seems that negative or inconclusive research results have been obtained for different target groups and different interventions [34, 93, 96]. Thus it is possible that workplace interventions are viewed primarily in terms of input, output, and transfer characteristics, without enough knowledge of the internal workings; in other words, the implementation is opaque. This might call for black box research to describe workplace interventions in greater detail.

Provision of workplace interventions varies considerably between countries with respect to type, as well as regarding the number of individuals with access to these interventions [50]. In a study conducted in six countries and including 1,631 employees sick leave due to low back pain, a mean of 23.4% of the participants (range 15.0–30.5% between the countries) reported *adaptation of the workplace*, 44.8% (range 41.0–59.2%) reported *adaptation of job tasks*, and 46.0% (range 19.9–62.9%) reported *adaptation of working hours*. Adaptation of the workplace had a positive impact on RTW rates, and adaptation of job tasks and adaptation of working hours were effective in promoting RTW after a period of more than 200 days of sick leave [50]. “*Workplace adaptation* included the realisation of adaptations in workplace including any technical

aids, such as a different chair or desk/table, special tools, a lifting aid, an adapted transport during work. *Adaptation in working hours* involved changes in number and/or pattern of working hours: different shifts, less or more hours (“partial work resumption”), more variation in hours. *Adaptation of job tasks* involved change of job tasks, including minor changes such as not having to carry things” [p. 290].

Complex phenomena such as musculoskeletal disorders and sickness absence [100] often require complex interventions, and thus there is frequently a need for evidence from studies examining implementation of multi-component interventions. In such cases it is important to answer the question of what combinations of interventions can be successful. Multidimensional intervention strategies require the evaluation of many underlying concepts [101]. The International Classification of Functioning, Disability and Health (ICF) developed by the World Health Organization (WHO) [102] is a conceptual biopsychosocial model that describes health and function (see Figure 4). The ICF includes health factors that can be modified by occupational health interventions [103], and it is also useful for categorizing workplace interventions by asking what the intervention is targeting [34].

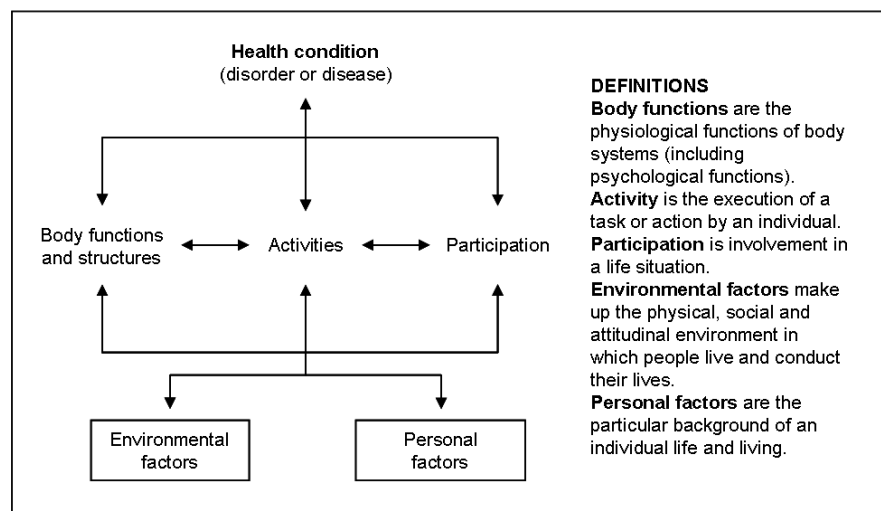


Figure 4. The WHO International Classification of Functioning, Disability and Health (ICF): a model and definitions of the health and health-related components.

The ICF and the International Classification of Diseases (ICD-10) are the two core classification systems developed by the WHO, which include diseases, disorders, and disabilities. The ICF codifies disabilities into different health and health-related dimensions within a framework of up to 1,424 codes. For example, in the field of occupational health, the ICF has been used to describe work-related factors that influence the health of employees [104], to outline the content of specific outcome questionnaires [105], to assess function in relation to sick leave and disablement pension [106], and serve as a conceptual framework to guide the development of a broader perspective of ergonomic interventions [107].

1.3.5 Work disability

The way we perceive work disability has gradually changed. It is now regarded as being the result of a complex interaction between components at the body, individual, and societal levels [102], or the outcome of the interaction between health care, the workplace, and the social security system [108, 109]. Notably, the increasing significance of the environmental aspects in this context has magnified the importance of the workplace as an intervention arena. A focus on reducing the consequences of musculoskeletal disorders (disability prevention), rather than directing all efforts towards preventing diseases, has been proposed as the paradigm of occupational medicine [109].

Employees with diseases or disorders of the musculoskeletal system constitute the largest group of people with sickness absence and disability pension in many industrialized countries [110]. This is also true in Norway (see Table 2), where four of every 10 sick leave days are connected with health problems in the musculoskeletal system. As seen in Table 2, approximately half of the days lost due to musculoskeletal disorders are located in the back or neck/shoulder/arm area.

Table 2. Sick leave diagnoses in Norway from 2001 to 2010 (percent of lost days)

Diagnosis	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Cardiovascular	4.9	4.9	4.8	4.9	4.9	5.1	4.8	4.5	4.5	4.4
Musculoskeletal*	44.9	44.3	43.5	41.8	42.1	40.3	40.4	39.8	39	40.2
Psychiatric	16.8	17.2	17.3	17.6	17.6	18	17.7	18.8	19	19.2
Respiratory	7.6	7.8	8.8	7.3	7.1	7.9	7.5	7.2	8.9	6.8
Pregnancy related	3.7	4.2	4.4	5.3	5.4	5.4	5.5	5.6	5.3	5.3
Other	22.1	21.6	21.2	23.1	22.9	23.3	24.1	24.1	23.3	24.1
*Back	13.7	13.4	12.6	11.8	11.5	10.9	10.7	10.6	10.3	10.5
*Neck/Shoulder/Arm	11.2	11	11	10	10.5	9.9	10	9.7	9.7	10

*Musculoskeletal disorders in the back and neck/shoulder/arm area are specified in the last two rows. The data are from the National Sick Leave Statistics, Norwegian Insurance Office.

An increasing number of people have complex health problems. Rates of work days lost due to musculoskeletal disorders are 42%, 40%, and 33% in Norway, Sweden, and the United States, respectively [111-113]. Furthermore, musculoskeletal disorders are the most common diagnoses for employees on sick leave in many countries [1]. Recurrent chronic pain accounts for a substantial portion of worker absence [112, 114], and the lower back and neck comprise the most common locations of such discomfort. Furthermore, comorbidity is frequently seen in musculoskeletal disorders [115, 116]. In addition to the consequences for the individual, such conditions represent a substantial economic loss for society [117].

Non-specific low back pain represents one of the most frequent and costly health conditions among employees in welfare states [118-121]. The WHO has indicated that low back pain is a leading cause of disability [122]. In as many as 90% of cases, low back pain is non-specific in nature [118]. This type of back pain is characterized by lapses/relapses and comorbidity [115, 123], the latter of which is associated with more frequent work disability [116].

Until now, more studies have focused on back pain, although it seems that neck pain has been more widespread in the general population than was previously known [124]. A recent review [125] showed that neck pain is common in the adult population, with an annual prevalence of 20% to 50% in the majority of the included studies. According to another large review [100], the annual prevalence of neck pain among workers varied considerably across countries, from 27.1% in Norway and 33.7% in the United Kingdom to 47.8% in Quebec, Canada [100]. Furthermore, the individual studies in the latter review showed a 50% prevalence of neck pain among employees with highly different occupations (e.g., dentists, nurses, office workers, and crane operators), whereas the annual prevalence of sick leave due to such pain varied from 5% to 10%. Thereby we could reason that most of those with such pain is at work. Also, office and computer workers were found to have the highest incidence of neck disorders amongst all occupations studied, higher than the prevalence observed in the general population [126].

The causes of musculoskeletal disorders are multifactorial [62, 100, 127]. Self-reported physical exposures such as sedentary positions for prolonged periods, repetitive work, prolonged cervical spine inflexion, working in awkward positions, inadequate keyboard and mouse positions, no chair armrest, and upper extremity posture have been shown to be risk factors for neck pain [58, 59, 100, 128]. Self-reported psychosocial work exposures such as job strain, low co-worker support, decreased job security, and overall stress at work have also been reported to be risk factors for neck pain [100, 128-131]. Individual factors such as age, gender, education [100, 132], and non-work-related aspects also contribute to the prevalence of neck pain [100, 130, 131]. Neck pain is a condition that is characterized by lapses and relapses [133], which in some cases, but not always, result in episodes of sick leave. Due to this complexity, it can be difficult to explain the contribution of different risk factors to the development and exacerbation of problems in the neck and shoulders.

Woods [134] reviewed 52 studies and found that poor social support was strongly correlated with an increased risk of musculoskeletal morbidity as well as limited evidence of a relationship between poor social support and musculoskeletal-disease-related sick leave and not returning to work after suffering from such disorders. Also, employees who have not returned to work within two to three months are at high risk of developing a disability and dropping out of the labour force [135, 136]. Therefore, providing workplace support and interventions that encourage early RTW has been seen as an efficient way to reduce socioeconomic and personal consequences of musculoskeletal disorders [30], and as a crucial factor in reducing the distance between the workplace and the employee who is off sick.

1.3.6 Return to work

The term *return to work*, with the acronym RTW, is being used increasingly in the scientific literature. In a review performed in the field of sickness absence and inclusion/exclusion [42], the databases Medline, PsycINFO, and ISI Web of Science were searched to find terms describing “going back to work”, and, among 617 hits in the titles of scientific articles, ten terms appeared that described this phenomenon (see Table 3). The most frequently used term in this category was RTW (spelled out or

abbreviated to RTW), which appeared in up to 95% percent of the hits in this category. It could be expected that there would be equal distribution of the terms *return to work* versus RTW, but that was not the case: in Medline, the acronym RTW constituted half of the hits, and the fully spelled *return to work* was found more seldom, whereas the opposite was observed in ISI Web of Science. The reason for this difference might be that the concept “RTW” is thus far not as developed in the social sciences as in medicine and health sciences. As can be seen in Table 3, newer terms such as *stable RTW* and *sustained RTW* seldom appeared in the literature.

Table 3. Terms in the literature describing going back to work after a period of absence*

Term	Total (n)	Medline (%)	PsycInfo (%)	ISI Web (%)
1 Return to work	384	38	24	38
2 RTW	200	50	31	19
3 Work resumption	12	33	33	33
4 Back to work	9	67	22	11
5 Stable return-to-work	5	100		
6 Return back to work	2	50		50
7 Return to work process	2		100	
8 Return from long-term sickness absence	1			100
9 Graded return to work	1	100		
10 Sustained return to work	1		100	

*These terms were found in the titles of articles in this field published in 2009 and 2010 [42].

The term *return to work* represents different concepts in the literature, and there is no consensus on core definitions [42]. Going through some of the literature [37, 38, 45, 50, 65, 88, 92, 94, 95, 97, 137-155] reveals that it is used in at least four disparate ways to describe the following (1) a point in time — this includes the time point of going back to work and is also used as an outcome measure (e.g., the first/second return or early return); (2) a type of work status — this means after a period of sick leave which also includes duration of the status (e.g., returned to work or sustained return to work); (3) a personal process or a rehabilitation process — this indicates going back to work as a process; (4) a type of intervention or a program — initiatives aimed at promoting return to work.

It has been claimed that RTW is a strong endpoint [156]. Simply measuring the first RTW does not describe the stability of work participation. Return as a point in time might be seen as several possible outcomes divided into early or late return. This might concern the first, the second, the third, or the fourth return, or it might be given different degrees extending up till a full return. Also, if RTW becomes more permanent, it might be characterized as sustainable or stable.

As a process, RTW has many similarities with work rehabilitation, occupational rehabilitation, or vocational rehabilitation. In the rehabilitation field, the paradigm shift from “train-then-place” to “place-then-train” approaches [157, 158] has strengthened the value of placement in a real context (as the workplace), early in the rehabilitation process. These approaches originated in the field of psychiatric rehabilitation and were further developed in the programmes called Individual Placement Support and Supported Employment [159, 160]. Their content has also been used in rehabilitation strategies aimed at promoting RTW among employees with musculoskeletal disorders

[161]. Integration of health care and workplace perspectives and competence, involvement of stakeholders, case management, and combining environmental changes with reducing symptoms are typical aspects of these types of interventions. Thus, they have many similar core components, frequently used in cases involving musculoskeletal disorders [37, 89-91, 98, 99, 109, 140, 162, 163]. As in the rehabilitation process, the person in the return process might need support from rehabilitation specialists. A study conducted in Great Britain revealed that as many as four out of ten employees on sick leave did not get rehabilitation support to help them get back on the job [164]. In many countries, RTW Coordinators are given a tailored post-bachelor's education to fill this vital role in the RTW process [149]. An investigation in this field [165] identified this group as a key to programme success and also defined 10 core competencies. Also, an observational study [163] revealed 10 underlying values related to decisions that rehabilitation teams make regarding RTW for employees.

Various determinants have been shown to influence the duration of time off work before returning. An investigation of 7,780 public employees on long-term sick leave in six municipalities in Denmark revealed that sex, ethnicity, and income had an impact on RTW during the entire three-year study period [166]. The cited authors also found that which municipality the people were working in, their diagnoses, and their age had an impact, but these determinants changed over the three years of follow-up, primarily during the first half of the period. Another study revealed that environmental factors are the most common barriers to RTW among injured workers [167]. All of the mentioned findings emphasize the importance of broadening the perspectives beyond the disease or disorder in the process of promoting RTW among sick listed.

1.3.7 Evidence-based practice, knowledge translation, and implementation research

There is a need for more documentary evidence from high-quality research on the effectiveness of interventions in practice [168, 169]. Accordingly, EBP has become a dominant paradigm in health care worldwide [170-172], and the demand from health authorities that practitioners use the best available evidence has gradually increased [173]. The same has occurred in the area of sick leave prevention and promotion of RTW. In short, the actors in that field face the challenge of how EBP should and could be used in situations where decision-making often concerns employees affected by high comorbidity, complex contexts, and substantial work demands.

Today, EBP is strongly tied to the Cochrane Collaboration, an organization named after the epidemiologist and physician Archie Cochrane, who claimed the following in an essay published in 1979 [174]: "It is surely a great criticism of our profession that we have not organized a critical summary, by specialty or subspecialty, adapted periodically, of all relevant randomized controlled trials". In this spirit, the first Cochrane Centre was founded in Oxford in the United Kingdom in February 1992 by the British National Health Service "to facilitate the preparation of systematic reviews of randomised controlled trials of health care" [175]. The Cochrane Library presently provides approximately 6,500 Cochrane systematic reviews of interventions and 650,000 clinical trials, and it has also contributed to the enormous progress in

intervention research. The sibling databases OTseeker and PEDRO for occupational therapists and physical therapists, respectively, also exclusively provide the results of RCTs and systematic reviews.

It appears that the use of scientific evidence from systematic reviews and RCTs can guarantee the prioritization and provision of efficient interventions at a national or group level. However, it might be questioned whether such evidence can determine the intervention choices in individual cases involving complex aetiology and comorbidity [176, 177]. Still, the most common definition of evidence-based medicine, which has also been widely used in health professions and non-medical fields, considers the target as being the individual patient and the process as being an intervention decision: “Evidence-based medicine is the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients” [178 p. 71].

At present, implementing EBP is first and foremost about using knowledge from systematic reviews, RCTs, and clinical guidelines. The PICO² framework has been developed to ensure that such knowledge can be found by practitioners [179-183]. Moreover, the steps of EBP have been implemented to guide that process [169, 183-185]. All these components are intended to enable EBP. Such practice has a clearly recognized aim—to use the best knowledge in intervention decisions—which is not always easy to achieve [186]. Cameron and colleagues [187] showed that most practitioners do not use these sources of knowledge in the planning of interventions, and that this is the case despite the availability of sound evidence [188, 189]. Moreover, some health care professionals reported that levels of knowledge, skills, and involvement were low in EBP [190], and this prompted the performance of several studies attempting to identify the obstacles to implementing this approach. It was found that these barriers included lack of knowledge, confidence, research skills, time, databases, and computers, and there was also an impact of large caseloads, staff shortages, and information deficits and overload [191, 192].

Many suggestions have been made as to why the translation of scientific knowledge can be problematic. In some cases this has been metaphorized as the gap between science and practice [193], with EBP representing “the bridge” between these two “cliffs” [194]. This implies that there are three possible targets for improvements and changes that can increase the translation of scientific evidence in intervention decisions: the patient and the practitioner (cliff A), the evidence (cliff B), and the translation processes (the bridge). Considerable effort has been devoted to the two cliffs. Scientists work hard to ensure the quality of their research results, and the Cochrane Collaboration has made huge contributions to raising the quality of experimental studies, and also to systemizing and synthesizing existing RCTs and systematic reviews in order to increase the availability of these results to practitioners. Furthermore, practitioners have frequently been targeted for behavioural changes, and this is often seen as the core solution for better evidence uptake in practice. In contrast, less has been done to explore and promote the translation process (the bridge). However,

²In the acronym PICO, P stands for patient, I for intervention, C for co-intervention, and O for outcome. This framework is used to steer the process of defining a question that is to guide searches of the scientific literature about effectiveness of relevant interventions.

interest in knowledge translation activities is reportedly increasing [195-201] and includes attempts to fill the gap between scientific evidence and decision-making in practice [195, 196]. Examples of this include national implementation research programmes that have been conducted in the Netherlands, the United Kingdom, and the United States [196]. These efforts are all based on how we define, understand, and view the patient and the practitioner, the scientific evidence, and the translation processes.

Even if it is accepted that a gap exists between evidence and practice, it appears that there remains an implicit assumption that scientific evidence from high-quality RCTs is relevant and suitable in all types of intervention decisions, regardless of case or situation. It is essential to ensure that the uptake of scientific evidence is feasible for health problems of this type in order to allow further development of EBP in workplace occupational rehabilitation. More knowledge is needed about the translational challenges in this type of practice.

Most of the literature in this context has focused on how clinicians could or should change their behaviour to become more evidence based [188]. This gives the impression that the translation challenge might be merely a technical problem rather than a fundamental or normative one, lending itself to solution by educational or collaborative efforts and by increasing available resources. However, McCluskey and Lavarini [202] showed that providing education improved knowledge but did not change behaviour, and thus it is questionable whether the willingness to change is the main problem, or if a more fundamental translation challenge is involved. Also, researchers frequently suggested that producing more research knowledge can solve this evidence uptake problem. Hence it seems that knowledge is still limited regarding the challenges that are involved in this matter. Graham and colleagues [203] ask whether we have got lost in knowledge translation and are thus describing different definitions and suggesting what these authors call a model of the knowledge to action process.

Every year, a number of both small and large intervention programmes are implemented in different parts of the world. These projects vary with respect to their rationales, as well as their knowledge bases and contexts, and how they are facilitated. In the widely used PARIHS framework, successful implementation of interventions programmes is seen simply as a function of the interrelation between three key components: evidence, context, and facilitation [204-207]. Some programmes start by implementing defined and described interventions based on high quality evidence, whereas others begin by using a system of facilitation, or local context engagement, without having a definite evidence-based approach or clearly defined interventions to implement. Thus they are built on experience and common sense. These programmes are “intervention explorative”, and the reasoning behind the choice of interventions can be found in the local workplace arenas. The literature available thus far has reported implementation of only a few such programmes, even though it seems that these initiatives are actually quite common. For this reason, the present research targeted one national programme aimed at preventing sickness absence prevention and promoting RTW.

2 AIMS

The general aim of the research underlying this thesis was to explore some certain aspects of workplace-based sick leave prevention and RTW. This included a focus on workplace interventions (studies III, IV, and V), leadership qualities (study I), and work demands (study II). Additionally, the aim was to reveal the potential challenges and solutions involved in translating scientific knowledge into intervention decisions in the RTW process (study III).

The specific objectives of the individual studies were as follows:

To elucidate leadership qualities that employees on long-term sick leave and their supervisors deem to be of value, when the subordinates are in the process of returning to work (study I).

To identify how employees on long-term sick leave due to musculoskeletal disorders and diseases describe their work demands (study II).

To identify possible challenges in translating scientific evidence into complex intervention decisions (e.g., regarding workplace interventions) for one typical employee on long-term sick leave, and to suggest possible solutions to these challenges (study III).

To identify the workplace interventions that twelve municipalities planned or implemented to reduce sick leave rates (study IV).

To conduct a systematic review of the literature concerning adult employees with neck pain to determine the content and effectiveness of workplace interventions as compared to no treatment, usual care, or other types of workplace interventions (Appendix: study V).

3 MATERIALS AND METHODS

3.1 AN OVERVIEW

The work underlying this thesis included analysis of research results obtained in the present case studies as well as existing published data (a Cochrane systematic review). Table 4 gives an overview of the material and methods used in the studies.

Table 4. Overview of the present studies

	Study I	Study II	Study III	Study IV	Appendix (study V)
Aims	To elucidate leadership qualities in the RTW process that were valued by employees on long-term sick leave and their supervisors	To identify how employees on long-term sick leave due to musculoskeletal disorders or diseases described their work demands	To identify possible challenges in translating scientific evidence into complex workplace intervention decisions, and to suggest possible solutions	To identify the workplace interventions planned or implemented by twelve municipalities to reduce sick leave rates	To determine the content, and effectiveness of workplace interventions for adult workers with neck pain
Design	Case study with an inductive approach	Case study with an inductive approach	A hypothetical case study	Case study with an inductive approach	Systematic review of the literature
Study population	Employees (n = 30) on long-term sick leave and their supervisors (n = 27)	Public sector employees (n = 8) on long-term sick leave	One occupational therapist meeting one typical employee on long-term sick leave	Municipalities (n = 12) participating in a national programme to reduce sick leave rates	Published RCTs (n = 10) including data on 2,745 employees
Data	Transcribed data from individual interviews (n = 57)	Transcribed data from individual interviews (n = 8)	Data on 30 employees on long-term sick leave were analysed to construct a typical employee on sick leave	Documents (n = 81) and transcribed data from focus group interviews (n = 12)	Data from 10 published RCTs deemed relevant after a systematic search of eight scientific databases
Analyses	Qualitative and quantitative content analyses, descriptive analysis, and T-tests	Qualitative and quantitative content analyses	Theoretical analysis	Qualitative and quantitative content analyses	Meta-analysis, GRADE analysis, descriptive analysis, deductive content analysis using ICF

Abbreviations: RTW = return to work; RCT= randomised controlled trial; ICF = International Classification of Functioning, Disability, and Health [102].

3.2 METHODOLOGICAL PERSPECTIVES

An inductive approach was used in the present research. Case study methods were applied in the overall design, and content analysis was the main technique used to

assess qualitative data. These methodological perspectives are further described in this section.

Inductive approach: It is often possible to measure the outcomes of sick leave and RTW, whereas it seems that the aspects of a workplace that might have an impact are difficult to identify, understand, and quantify. Plausibly, a deductive approach that starts with theories and hypotheses and ends with findings [208] might limit the phenomenon under study, if the theories do not cover the complexity of what is studied. This in turn will influence what the findings of the research will be, and hence it is recommended to apply the strategy that is often the opposite of the deductive approach (i.e., the inductive approach) when existing knowledge about the topic under investigation is lacking, limited, or fragmented [209]. Accordingly, the current research mainly used an inductive approach [208-210] to explore workplace aspects that were selected as relevant for sick leave prevention and RTW. This choice is justified by the limited number of specific and detailed theories that have been published, especially concerning leadership qualities, but even about workplace interventions aimed at reducing sick leave and promoting RTW. The first phases of grounded theory [211-214], as well as an inductive content analysis [214-217], are methodologies that extract conceptual knowledge from empirical data [218]. It also seems that theories in this field have less frequently been built on empirical data in which core stakeholders such as persons on long-term sick leave describe their situations themselves, based on their own experiences. Such perspectives might provide new insights into the field of workplace prevention and rehabilitation.

Case study methods: Four of the studies in this thesis used case study methods [208, 219, 220] as an overall design. The rationale for this choice stemmed from the frequently quoted definition given by Yin [220], which states the following: “A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident” [p. 13]. The case is often stipulated as the unit of analysis [208, 220], and here the cases were as follows: in studies I with 30, and in study II eight employees on long-term sick leave; in study III, a rehabilitation team; in study IV, 12 municipalities (e.g., public organizations). This research strategy is known to be a flexible procedure for collecting data and for using combinations of different types of data, often both qualitative and quantitative [208, 220]. Consequently, the division between qualitative and quantitative research is not very evident in this type of research. Furthermore, case study research does not entail traditional statistical generalization towards a defined population from which the sampling is done, but rather involves theoretical or naturalistic generalization [219, 220]. Stake [219] has described naturalistic generalization as “recognising the similarities of objects and issues in and out of context and by sensing the natural co-variations of happenings” [p. 6]. Stake stressed that generalization should be added along with particularization. It is possible that full and thorough knowledge of the particular can become useful understanding even in new and foreign contexts [219].

Content analysis: Content analysis was applied to different types of data in all five of the present studies. Content analysis has its roots dates back to the 17th century, although it was not given a name until 1941 [221]. It is an often used method for data

analyses [215, 216, 222, 223]. Earlier, the most often used data were different types of written or official documents, whereas later interview transcripts and observational logs are more often used [209, 215-217, 221-224]. This method can be used as a combined qualitative and quantitative strategy, as was done here, or as either of those approaches separately [222, 223]. In studies I and II, the first phase of the analysis was qualitative with the aim of obtaining new terminology and understanding of the phenomenon under investigation. The type of content analysis that is more qualitative in nature appeared more recently and was further developed especially in health research [215-217, 224]. The process of content analysis is often inductive and aims to reveal terminology and descriptions close to empirical data. The variety of descriptions is determined by the quality and depth of the data. This phase is performed that is fairly similar to other methods of qualitative analysis, such as for example grounded theory, although the results are often communicated in a different manner (descriptions versus theory). The second phase of the assessments in the current studies represents the more traditional content analysis, in which data (e.g., text or meaning units) are quantified [222, 223]. The second phase differs from the first phase in that the aim is to describe reporting profiles; this makes it possible to construct hypotheses that can later be subjected to deductive hypothesis testing using representative sampling strategies from a defined population, which can enable statistical generalization. Quantification in content analysis is done on the level of words or meaning units, not informants. Thereby, the generalization of results is not statistical in nature. Therefore, it is important to emphasize that the purpose of the quantification conducted in the current investigations was not to achieve statistical generalization, but rather to create new hypotheses that might be further tested in representative studies.

3.3 STUDIES I AND II

Design: Studies I and II were performed as parts of the larger *Rogaland RTW case study*. The research design was built on case study methodology [219, 220], and employees on long-term sick leave constituted the cases. Qualitative and quantitative content analyses [215-217, 222-224] were the main methods used to assess the data.

Informants: Thirty employees were recruited from a selection of 19 companies in different sectors. The employees' immediate supervisors ($n = 28$) were interviewed once. Case study methods was chosen to achieve a flexible approach for data collection, and interviews were performed when needed, and all relevant documents were collected as the process progressed individually and differently. The informants were recruited through their companies, and all recruiting of companies took place over a period of 14 months in 2005 to 2006. An occupational health service was used as a collaborator for recruitments among their member companies. Direct contact was also made with other relevant companies. The sampled companies were selected to ensure diversity regarding size, public versus private sectors, and high versus low rates of sick leave. Such a heterogeneous sample was established in order to obtain a more comprehensive understanding at both the individual and the organizational level. Three public services and sixteen private businesses agreed to participate; these represented health care, social services, schools, kindergartens, service firms, financial firms, and industry. Thirteen of the nineteen were inclusive working life companies, that is, they had signed an agreement with the national insurance office.

The employees were selected with the aid of the company personnel systems, which obtained information concerning the following three selection criteria on the date of recruitment: (1) on sick leave for eight weeks or more during the previous six months due to a personal health situation (i.e., not due to sickness or illness of a family member); (2) on full or partial sick leave; (3) employed by the company at least 50% of full-time during the previous eight weeks. The supervisors were identified as those who had been primarily responsible for following the employee on sick leave during the period of absence. Thus, the informants consisted of a heterogeneous sample of employees ($n = 30$) on long-term sick leave (>8 weeks) due to different diseases or disorders, and also their immediate supervisors ($n = 28$). Several of the included employees comorbidities, and 77% of the subordinates and 69% of the supervisors were women. Some of the 19 services/businesses did not have any employees on long-term sick leave during the period of interest, whereas others did have such employees but declined to participate in the project. Accordingly, the informants in the study came from a selection of the 19 services/businesses. The public sector organizations had higher sick leave rates and more employees, and staff members were easier to recruit, and thus as many as 19 of the 30 informants came from that sector; 11 of those individuals came from health care and seven from schools/kindergartens. All 58 of the informants (subordinates and supervisors) participated in *study I*. The informants in *study II* consisted of a selection of eight female public sector employees with musculoskeletal disorders and diseases. Three were working in nursing homes/home-health care, three in kindergartens/schools, and two in social security or administrative offices.

Data collection: Potential informants were sent a postal invitation asking them to take part in the study. The invitation contained letters from both the researchers and the companies employing the individuals, which assured the prospective participants that their identity would not be divulged to the researchers. The invitation also included written information about the study and asked the recipients to fill in and return an informed consent form if they decided to participate. This meant that the researchers did not know who did not answer. When an employee agreed to take part, his/her supervisor also participated in accordance with an agreement between the company and the researchers. One of the subordinates did not want us to interview her/his supervisor, and another supervisor was never interviewed due to appointment problems. Each case was followed for eight to twelve months. Each person on long-term sick leave was contacted two to eight times during the period, depending on how the process developed. Each immediate supervisor was interviewed once. The employees on sick leave were followed when absent from work, and also after returning to work if that situation arose. A total of 107 interviews were conducted with those on sick leave and 28 with the supervisors. The 135 interviews were recorded digitally and transcribed verbatim. The informants were given open-ended questions from a theme-based interview guide. Some semi-structured interviews were also conducted using the assessment tools Worker Role Interview (WRI) [225] and Work Environmental Impact Scale (WEIS) [226], which have been tested for validity and reliability [227, 228] and are based on the Model of Human Occupation [73, 74, 76]. Relevant documents related to each case and the sickness process were also collected, such as action plans, epicrisis,

medical records, minutes of meetings, sick leave forms, documents from the social insurance office, employers, GPs, specialist health services.

Selections of this large material were analysed in two of the studies: 57 of the 135 interviews in *study I*, and eight interviews performed with WRI and WEIS in *study II*. The documents were not used in these two studies.

Data analysis: All interview soundtracks were transferred from the portable voice recorders to a secure computer network and deleted from the recorder. Names and places were changed to ensure anonymity. Thereafter, the recordings were transcribed verbatim. The interviews were performed in Norwegian, and two independent researchers translated the main results into English, with disagreements resolved by discussion and consensus. Combined qualitative and quantitative content analysis was applied [215-217, 222-224].

In study I, three category levels were identified in the material. The third-level coding involved condensing the meaning in the interviews line by line to reveal descriptions of leadership qualities. In the second-level coding, the phrasings from the informants were used as much as possible when naming the leadership qualities. The first-level coding described leadership types based on leadership qualities. Descriptions were formulated and used to categorize different leadership qualities according to similarity into leadership types. Finally the descriptions of leadership qualities were condensed without the loss of any significant information. Many informants gave the same or very similar descriptions, which we combined. Descriptive statistical analyses using the Statistical Package for the Social Sciences (SPSS, version 15.0) in combination with Microsoft Excel were applied to reveal the reporting profiles and patterns of single informants and informant pairs (subordinate and immediate supervisor), and the differences in reporting between the two informant groups, age groups, genders, sectors, and branches. Independent sample t-tests were performed to compare means of agreements between groups.

In study II, the text was first subjected to a reduction process in which the recorded interviews were transcribed, but inconsequential words were deleted. Meaning was condensed and categorized in order to identify work demands [222, 223, 229]. The transcripts were first read in their entirety in an attempt to discover natural themes. The aim was to find the implicit meaning in the explicit statements, and thereby identify work demands by transforming the meaning into themes. To express the described theme, a phrase was selected as an adequate code for a category, after which the physical demands were identified. In addition, the demands were distinguished having a positive, a negative, or no impact on the work performance, based on the informants' descriptions. The described demands were then sorted into three categories according to whether the sick listed employee regarded themselves or the employer/work environment, or both, as being the maker of the demands.

3.4 STUDY III

Design: Innovative study methodology was applied. A case study was constructed and analysed to identify possible translational challenges and possible solutions to the

challenges. This case study comprised five components (see Figure 5): (1) a physician's referral of a fictitious woman named Denise, described as an employee who was on long-term sick leave due to low back pain and comorbidity, and required workplace interventions; (2) a rehabilitation team at an outpatient RTW clinic that received the referral; (3) the six EBP steps; (4) the PICO framework; (5) the final component consisting of scientific evidence from a high-quality RCT, which was identified using the EBP and PICO components. In short, the initial task was to create a typical person on sick leave for the referral, which was achieved by analysing the empirical data on 30 employees on long-term sick leave. Thereafter, the six EBP steps and the PICO approach were used to manage performance of an EBP process. Next, the challenges in the EBP process were identified by analysing the subsequent reflections. Lastly, the challenges revealed in the EBP process were isolated, presented one by one, and finally systematized into a suggested revision of the EBP steps. These five components are further described below.

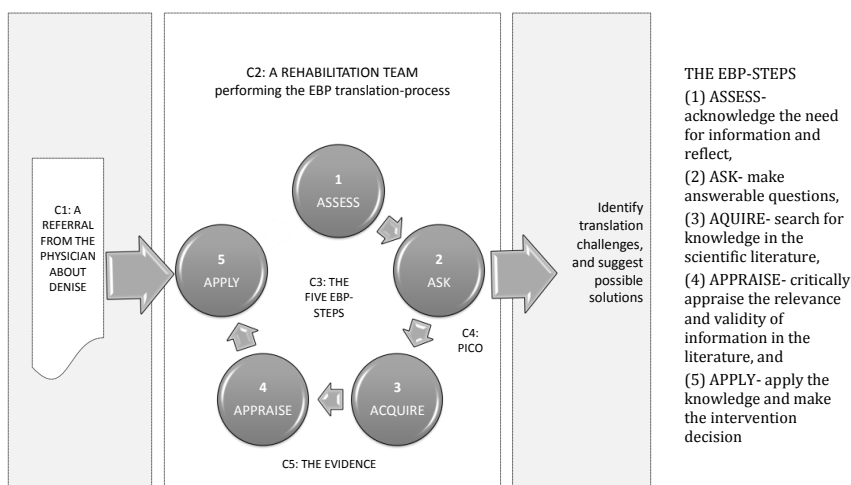


Figure 5. Overview of the five components (C1-C5) of the evidence-based translation process in this constructed case study. These five steps are described in the text.

C1 The referral: The physician's referral gave information about Denise, who was described as a secretary who worked in the public sector and had high comorbidity. The case of the employee Denise was developed from analyses of the core characteristics of 30 employees on long-term sick leave, who were followed for approximately eight months each in the Rogaland RTW study [137, 230, 231]. Several transcripts from 135 interviews with these employees and their immediate supervisors were analysed, along with documents (n = 250) from health care, social insurance offices, and employers. Qualitative content analysis [215-217, 222, 223] were used to identify typical features of the cases, such as age, gender, family situation, occupation, health status, health problems, functioning, work ability, work capacity, and aetiology. The aim was to be able to construct three typical employees on long-term sick leave, and Denise was one

of these. This means that Denise could be regarded as a typical employee on long-term sick leave in the context of the working life and social security systems in Norway.

C2 The team: Denise's referral was sent to a hypothetical rehabilitation team that was organized in an outpatient RTW clinic and worked in close contact with the employees, employers, and workplaces. The RTW clinic had a multi-professional staff including a physician, an occupational therapist, a physiotherapist, and a psychologist. The team gave the responsibility of being Denise's case manager to the occupational therapist Eve, and this involved establishing and maintaining contact with the workplace, social insurance staff, and other health care services. The RTW clinic had already applied an evidence-based approach. Therefore, Eve had learned how to implement and practice EBP according to the steps of such practice and the PICO framework, and she did not encounter any of the problems that are often reported in the literature as being obstacles to EBP. In short, she was confident in performing EBP.

C3 The EBP steps: This hypothetical case study was guided by use of the EBP steps, which are further described here as they appear in the literature. The 4, 5, 6, or 7 steps have been developed to steer the process of performing EBP [176, 179, 180, 182, 184, 232-236]. Summarizing, they involve the following components: (1) ASSESS, acknowledge the need for information and reflect; (2) ASK, create answerable questions; (3) ACQUIRE, search for knowledge in the scientific literature, (4) APPRAISE, critically assess the relevance and validity of information in the literature; (5) APPLY, make use of good knowledge and arrive at a decision. The literature also contains a few exceptions to the above-mentioned steps. Some investigators have also included a sixth step denoted *evaluation* [184] or *dissemination to colleagues or organizations* [234]. One publication included a step after APPRAISE, which was designated *Integrate the evidence with clinical expertise and patient preferences and values* [234], and another article added a step in which the ASK step should be answered on the basis of professional expertise before it is answered by the scientific literature [185]. Bennett and Bennett [169] put forward their four EBP steps (ASK, SEARCH, APPRAISE, USE) as a third frame outside two other frames, which they called (1) the client context and (2) the (occupational therapy) treatment process/therapy context.

C4 The PICO framework: The PICO framework was also used in the hypothetical case study. The "P" in PICO stands for the type of patient, "IC" indicates the type of interventions and co-interventions, and "O" represents the outcome. The PICO framework was developed to enable the practitioner to ask what is often referred to as a good question, an answerable question, a clinical question, an appropriate question, a searchable question, or a well-built question [180-183, 237, 238]. The PICO format is to be used in EBP step 2 (ASK), with the aim of targeting relevant sound evidence in the scientific literature, despite an information overload.

C5 The scientific evidence: The fifth component of the hypothetical case study comprised scientific evidence from systematic reviews, RCTs, and clinical guidelines. Here, high-quality evidence was selected to make it possible to reveal types of challenges other than those concerning methodological limitations and flaws in available studies.

Applying the EBP process to the hypothetical case study: The EBP translation involved going through the EBP steps, and this constituted the context of the analytical process in this study, which was performed to identify the challenges and the solutions.

Step 1 Assess: The case manager Eve started by assessing all knowledge about the case in order to provide evidence-based treatment to the patient. Thus far, the team's knowledge of Denise was derived solely from the information in the referral. Eve determined that the case was multi-factorial. In the EBP course she had attended, Eve had learned to apply scientific evidence from systematic reviews and RCTs of high quality, and that *evidence* is often easy to assess and apply when it is formulated as clinical guidelines. Hence Eve started her work using this type of knowledge.

Step 2 Ask: Eve had learned how to ask answerable questions by using the PICO framework. She attempted to determine which patient group Denise belonged to, remembering that the "P" usually refers to the person's diagnosis. However, Denise had several diagnoses, whereas most of the literature was diagnosis specific. How could this discrepancy be resolved? Eve decided to choose one of the diagnoses, low back pain, which she believed was the disorder that had the most extensive impact on Denise's ability to work. "P" could also refer to the type of job Denise had, so Eve needed to find literature on people working as secretaries in service occupations, as well studies about women in the same age group as Denise. Next, Eve considered the "I" and "C" components of the PICO framework, eliminating therapies that were similar to those Denise had tried previously. The referral from the physician had also indicated that more workplace-targeted interventions were needed. Considering the "O" component, it was obvious what outcome was relevant, because Denise wanted to get back to work as soon as possible. Eve formulated the following PICO question: *"What interventions are effective to achieve a fast RTW for a 35-year-old female secretary with chronic low back pain?"*

Step 3 Acquire: The first thing that Eve did in this step was to look for clinical guidelines concerning chronic low back pain. She found that, for conservative treatments, the European Guidelines for chronic non-specific low back pain [239] recommend cognitive behavioural therapy, supervised exercise therapy, brief educational interventions, and multidisciplinary (bio-psycho-social) interventions. Specific workplace interventions were not covered in those guidelines. Eve then conducted a literature search in the Cochrane Library. Few of the studies she found assessed the outcome of RTW, and most focused on outcomes such as pain and function. Eve used the domains of the WHO International Classification of Functioning, Disability, and Health (ICF) [102] to systematize the interventions in the identified studies, and she found that most of these were aimed almost exclusively at the patient's body functions or body structures. At this stage, Eve considered these types of interventions to be irrelevant for Denise due to her treatment history. Only a few of the interventions included workplace components. Eve subsequently found a review about biopsychosocial rehabilitation of chronic low back pain [240], which described conflicting evidence regarding effectiveness in relation to vocational outcomes. Eve was not sure how to use this observation. She finally found an article that could be relevant to Denise's situation, which described an intervention called *a*

multidisciplinary rehabilitation programme for back and neck pain [241]. The authors had concluded that this intervention increased RTW in women who were aged 16–60 years, working in service/care occupations, and suffering from back/neck pain. Eve decided to proceed with this promising study.

Step 4 Appraise: Eve pondered the fact that the subjects in the above-mentioned study [241] had been on sick leave for a maximum of 6 months due to spinal pain, whereas Denise had been on full-time sick leave for 9 months. Eve wondered whether this difference rendered the information in that study irrelevant in Denise's case. The third intervention in the cited investigation was called behavioural medicine rehabilitation (BM), which led to outcomes superior to those obtained with the other two interventions and for the control group. The mean number of sick leave days for women was 201.3 less in the BM intervention group than in the control group. Eve considered this to be a good result for "the mean person" in the group, but was eager to determine the effects for a specific individual such as Denise. She found that the BM group consisted of only 20 women and wondered whether the power of the study was sufficient to translate the results to Denise. Eve tried to find the spread of values for the 20 women and noted that the 95% confidence interval (CI) was extremely broad, 1.3 to 403.9. For 95% of those participating in the study, the improvement in the BM group compared to the control group consisted of a reduction of sick leave by a mean of 403.9 more days at "best" and 1.3 more days at "worst". Eve felt that she needed more information about who really did or did not benefit from the intervention. For example, did only a few of the 20 women exhibit enormous improvement, and most of them experience only moderate, limited, or even adverse effects? Did they have neck or back pain? What types of occupation did they have? What kinds of companies did they work for? What types of work did they perform? Eve concluded from the confidence interval that only a few of the women—possibly only one or two—experienced a small adverse effect in the form of having more sick leave days than the average participant in the control group.

Step 5 Apply: Eve was not sure if this intervention programme would comply with Denise's personal preferences, health condition, type of work, occupation pattern, and workplace environment. Even if it was suitable, more information was still needed about how to apply the programme in her case, also taking into consideration the resources and competence that were available. If the intervention programme that was applied to Denise differed too much from the original programme, it would probably not produce the same positive outcome. Eve decided to contact the first author of the study to get information about the intervention programme, so that the rehabilitation team could scrutinize the content. She was eager to be guided by the scientific literature, but felt that a decision regarding type of intervention was still a long way off, even though the EBP steps were completed.

3.5 STUDY IV

Design: The overall design of this project comprised descriptive case study methods [219, 220] with an inductive approach. Qualitative and quantitative content analyses [215–217, 222–224] were the main techniques used to assess the data.

Informants: A national intervention programme was conducted from January 2007 to July 2010 in Norway with the aim of reducing sick leave rates in municipalities. The programme was founded on a tripartite agreement between the government, employers, and employee organizations. Three governmental offices were involved: the Ministry of Local Government and Regional Development, the Ministry of Labour, and the Ministry of Health and Care. A secretariat was created to support the participants in the programme.

Twelve programme municipalities constituted the cases. The municipalities were selected to join by the programme owners on a non-voluntary basis, and the focus was on reducing sick leave rates. Two of the 12 municipalities were chosen as “model participants” because they had long experience of work involving sick leave interventions; the other ten were selected because they had high sick leave rates. The municipal organizations included primary health care units (e.g., home health care, nursing homes, and rehabilitation units), kindergartens, and schools (e.g., primary and lower secondary mandatory levels, grades 1–10); these had 19,611 employees who were responsible for giving service to a total of 256,681 inhabitants. The sick leave rates among these employees varied from 6.6% to 13.9% during the programme period. All municipalities were obligated to organize a tripartite project group with its own leader. Stakeholder involvement was required by employees, employers, union representatives, and politicians. The 12 municipalities were divided equally into two network groups, each including one “model municipality”. The main aim of the networks was to inspire each other in the process of defining and implementing workplace interventions related to sick leave. All organizations were obligated to develop an intervention plan and to execute interventions that would involve a wide range of actors and stakeholders.

Data collection: Two types of data were used: documents (n = 81) and focus group interviews (n = 12). All relevant documents (n = 69) that each municipal had developed within their organization and in their project network during the first six months of the program were collected in the spring 2007. These were provided on request by the programme secretariat or the local project groups. At the end of 2010, revised versions of the intervention plans were collected on the programme’s website. Among other things, these documents consisted of the following: intervention plans (mandatory for all twelve), overall planning documents, sick leave statistics, procedures and routines, project documents, brochures, pamphlets, PowerPoint presentations, and memos from the network seminars. The documents contained information on planned and/or implemented interventions, as well as some information about the rationale for the implemented measures. The project groups (usually all 3–5 members from each) participated in a 30–40-minute-long group interview, and in the leaders of all groups were present. Most of the leaders were from the human resources departments or were unit managers of nursing homes, home-based care, schools, or kindergartens. The focus of the interviews was the participants’ experiences of the various interventions they had planned or provided in the organization. The interviews were audiotaped and transcribed verbatim before analysis. Two of the interviews were not recorded due to technical problems, and these were instead reported as handwritten memos.

Analysis: Qualitative and quantitative content analyses were applied to documents and transcripts to reveal meaning units and categories [215–217, 222, 223] about workplace

interventions. To avoid limiting the phenomenon under study, workplace interventions were defined as “all types of workplace efforts described as being aimed at reducing sick leave, preventing disability, and/or promoting RTW”. The interviews were performed after the first 69 documents had been analysed. To be able to describe and compare interventions for all the cases as a whole, some of the analyses were performed at the intervention level. First, the entire text in each document, except the revised intervention plan, was analysed sentence by sentence to identify meaning units that gave *intervention descriptions* (e.g., planned, ongoing, and implemented interventions). The same process included a search for the rationale and contextual background of the chosen interventions, such as *problem descriptions* (e.g., what problems the municipal experienced in relation to sickness absence), *goal descriptions* (e.g., what goals the organizations had defined for their interventions), and *criteria for success* (e.g., what factors they experienced as important or crucial for achieving the desired results). Thereafter, the condensed texts were re-written as short reports for each municipality and sent to the respective programme teams for verification. All teams were contacted to ensure that these short texts presented the real workplace interventions that were planned or implemented in their organization. These meaning units about intervention descriptions were further coded and categorized on three levels: intervention type, intervention groups, and condensed intervention descriptions. Later, these descriptions were compared with the intervention plans from 2009 to ascertain whether there had been any changes. To enable re-contextualization, the interviews and documents were further analysed to find the reasons for the differences in intervention profiles between the twelve cases.

3.6 APPENDIX (STUDY V)

Design: The design of study V was consistent with the systematic review methodology outlined by the Cochrane Collaboration (www.cochrane.org). All phases of the review work were developed according to the Cochrane Handbook for Systematic Reviews of Interventions [242] and the 2009 Updated Method Guidelines for Systematic Reviews in the Cochrane Back Review Group [243]. We performed three broad comparisons: (1) workplace intervention versus no interventions, (2) workplace intervention versus usual care, and (3) comparison of two or more workplace interventions.

Inclusion/Exclusion criteria: Only RCTs were included, there were no language limitations, and the sole targets were adults who were of working age (18 to 67 years) and were either on the job or were absent (on sick leave, early retirement, or disability pension) but still connected with the workplace through permanent or temporary employment agreements. All sectors, branches, and types of jobs were included. The targeted employees were to have reported neck pain of acute (< 6 weeks), sub-acute (6–12 weeks), or chronic (\geq 12 weeks) duration. Shoulder pain was included only if it was described in conjunction with neck pain. The fluctuating nature of neck pain constituted a challenge when defining the target group for this review, but we solved this problem by including only studies in which at least 50% of the baseline population had neck pain. Neck pain due to specific pathological conditions such as fractures, tumours, infections, inflammatory processes, and ankylosing spondylitis were excluded.

The *interventions* could be a single strategy, or a combination of strategies, with different intervention programme labels (i.e., modified work, participatory ergonomic, ergonomic workplace visit, RTW interventions, or multidisciplinary ergonomic interventions). By use of ICF terminology, we defined workplace intervention as: “any action at the workplace with the aim of preventing health problems and disability, maintaining participation in work and reducing sickness absences, or facilitating early return-to-work. These interventions seek to modify the employees' physical or mental functions, their activity performance, participation challenges or the physical, social or attitudinal environment”. Studies about clinical and health care interventions conducted outside the workplace were excluded. Also, studies were not included if they concerned exercise [244, 245] and multidisciplinary biopsychosocial rehabilitation [246], because those were covered in other Cochrane reviews.

Harms and other adverse effects were included if they were reported in the studies. The timing of outcome measures was reported according to the descriptions used in the included studies, and they were grouped as being short term (measured closest to four weeks after randomization), intermediate term (measured closest to six months after randomization), or long term (measured one year or longer after randomization) [243]. Trials were included if they measured at least one of the following *outcomes* recommended by the Cochrane Back Review Group [243]: pain severity or pain prevalence that was self-reported on a visual analogue scale or the NSR scale, or was measured as the proportion of those with pain; absence from work, considered as time on benefits, number of hours or days on sick leave or lost time, proportion of individuals returning to work, employment status; shift in employment status to working full-time, working part-time, or being on sick leave, disability pension, or early retirement.

Search strategies: Potential trials were identified by computer-aided searches (to July 2009) of these electronic bibliographic databases: CENTRAL (*The Cochrane Library* 2009, issue 3), MEDLINE, EMBASE, CINAHL, PsychINFO, ISI Web of Science, OTseeker (Occupational Therapy Systematic Review of Evidence), and PEDro (the Physiotherapy Evidence Database). The intervention section of the searches was purposely left open, because of the diversity of terms used to describe workplace interventions. References cited in included trials were also screened, and experts in the field were contacted to obtain additional studies.

Data collection: Before selection, the titles and abstracts (if available) of all identified studies were collected and duplicates were removed. We assessed our interpretation of the inclusion criteria in a pilot study of a sample comprising ten articles, some of which we considered to be definitely eligible, some definitely not eligible, and some questionable. The inclusion form was revised in this manner. For all articles that had abstracts that appeared to meet our inclusion criteria, or either lacked abstracts or had abstracts upon which a decision could not be made, the full texts were obtained and independently screened by the same two reviewers to determine whether they met our inclusion criteria. Consensus was used to solve disagreements; if disagreements persisted, a third reviewer was consulted. We dealt with missing data by contacting the original investigators to request the absent information. Furthermore, any assumptions

concerning methods used to cope with missing data were made explicit, and the potential impact of missing data was addressed.

Data analysis: Initially, two reviewers worked independently to *extract data* from the included studies and record them on a standardized form. Twelve criteria were used to assess *the risk of bias* in the included studies [243], and each of these was scored “yes”, “no”, or “unclear”. A trial with low risk of bias was defined as, at the least, having met criteria 1 (randomization), 2 (allocation concealment), 5 (outcome assessor blinding), and any three of the remaining nine criteria. Two reviewers independently assessed the risk of bias in a selection of trials and reached consensus on the final results. A third reviewer assessed the risk of bias in all included studies. Only one meta-analysis could be performed due to between-study diversity of interventions, outcomes, outcome measures, type of workers, and follow-up times. The two studies forming the meta-analysis were homogeneous in that they both focused on the body functions. For the outcomes, odds ratios (ORs) were calculated for dichotomous data, and mean differences were computed for continuous data with 95% CIs.

Some of the studies tested a single intervention, whereas others tested a set of interventions. Therefore, a content analysis of the interventions was performed as outlined in the 10 papers included in the review with the objective of delineating the exact content of the intervention. In these efforts, the ICF [102] was used as a conceptual framework to help describe the components of the intervention(s) in the included studies. Assessments aimed at determining whether a specific intervention is clinically justified should not be based solely on statistically significant findings. Thus, we attempted to address five questions that could help determine the clinical relevance of the interventions [243].

Regardless of whether we had sufficient data to combine the results statistically, we assessed the overall quality of the evidence for our primary outcomes by using an adapted GRADE approach [243, 247]. The quality of the evidence for a specific outcome was based on the performance against five domains: limitations of the study design, inconsistency, indirectness (inability to generalize), imprecision of results (insufficient or imprecise data), and publication bias across all studies that measured the outcome. Two review authors worked independently to perform the GRADE analysis. Initially, the quality was good when at least two RCTs with a low risk of bias provided results for the outcome, and it was reduced by one level for each of the subsequent domains that were not met: *High quality evidence*. At least 75% of RCTs with no limitations of the study design, consistent, direct and precise data and no known or suspected publication biases. Further research is unlikely to change either the estimate or our confidence in the results. *Moderate quality evidence*. One of the domains was not met. Further research is likely to have an important impact on our confidence in the estimate of effect and might change the estimate. *Low quality evidence*. Two of the domains were not met. Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate. *Very low quality evidence*. Three of the domains were not met. We are very uncertain about the estimate. *No evidence*. No RCTs were identified that addressed this outcome.

3.7 ETHICS

The Rogaland RTW case study (studies I and II) was approved by the Regional Medical Ethics Committee for Western Norway on 2 February 2005. It was initially planned that the project would collect data about self-exclusion and drop-outs, but this was not approved by the Ethics Committee, because there was a risk that the informants could be identified. For the same reason, we were not allowed to give information about how many participants came from each company.

The Norwegian National Ethics Committee for Medical and Health Research reviewed the plan for Study IV and deemed that this investigation did not have to be submitted for ethical approval.

4 RESULTS

4.1 AN OVERVIEW

The main results of the five studies included in this thesis are presented in Table 5.

Table 5. Overview of the main results of the present research

	Aim	Main results
Study I	To elucidate leadership qualities that were valued in the RTW process by employees on long-term sick leave and their supervisors	Altogether, 78 distinct leadership qualities and seven leadership types were identified from 345 meaning units. The three most valued leadership qualities were “ability to make contact”, “being considerate”, and “being understanding”. The three most valued leadership types were those we (based on the analysis) designated Protector, Problem-Solver, and Contact-Maker. The subordinates more often described the types called Encourager, Recognizer, and Protector, whereas the supervisors most often mentioned the Responsibility-Maker and the Problem-Solver. Together, Protector and Problem-Solver represented the combination of leadership types that was reported most often.
Study II	To identify how employees on long-term sick leave due to musculoskeletal disorders and diseases described work demands	Fifty-one work demands were described, most of which were emotional and cognitive, and only five were of a physical nature. Work demands were sometimes described merely as negative or positive, but also as both. Most of the negative demands were emotional and cognitive challenges in mastering the work tasks, and they were claimed to have been experienced by the employee herself (n = 36), and in only a few cases by the employer/environment (n = 7) or both (n = 8).
Study III	To identify challenges and possible solutions in translating scientific evidence into complex workplace intervention decisions	Various challenges arose when a health care personnel was to work according to EBP on a case involving RTW. Evidence from RCTs seemed to differ depending on whether it originated from interventions with preventive, curative, or rehabilitative aims. Moreover, it appeared that in some instances evidence came from “good-for-all” interventions but at other times from “tailored-type” interventions. Thus, it was found that there was a need to differentiate the roles of evidence in terms of whether it inspired, challenged, enlightened, informed, or determined the intervention decision. In general, the EBP steps and PICO framework seemed to construct a confined decision process. Possible solutions to the 10 challenges and revised EBP steps were suggested.
Study IV	To identify the workplace interventions that twelve municipalities planned or implemented to reduce sick leave rates	Fifteen workplace interventions (WIs) were identified and were categorized into two groups based on their targets in the organizations: nine <i>organizational WIs</i> , targeted structures, processes, and/or culture in the organization (n = 220 descriptions, 72%); six were called <i>employee WIs</i> , because they targeted employees (n = 86 descriptions, 28%). The organizational WIs involved running a process in the organization from assessment to evaluation, but also development of routines/systems, cooperation/collaboration, information/education, building culture/anchoring, and recruitment/staffing. The employee WIs involved well-being/lifestyle interventions, physical activity/exercise, redeployment, adaptation, follow-up of persons on sick leave, and RTW programmes. The intervention profiles varied considerably between the municipalities.
Appendix (Study V)	To conduct a systematic review of the scientific literature regarding adult employees with neck pain to determine the content and effectiveness of workplace interventions	From 1995 references found, 10 RCTs (2,745 employees) were included. Two had a low risk of bias. Eight examined office workers. Few workers were on sick leave. Thus, WIs were seldom designed to improve RTW. The WIs comprised education about stress management, principles of ergonomics, anatomy, musculoskeletal disorders, and the importance of physical activity. They taught “pause exercises”, how to use a relaxed work posture, proper positioning, the importance of rest breaks, and strategies to improve relaxation. Some studies also included how to modify work tasks, workload, working techniques, positions, and work hours. Several studies suggested how to make adjustments and recommended modifications at the workplace. Overall, there was low quality evidence that showed no significant differences between WIs and no intervention for pain prevalence or severity. There was moderate quality evidence (one study, 415 workers) that a four-component WI was significantly more effective in reducing sick leave in the intermediate term (OR 0.56, 95% CI 0.33 to 0.95). If present, significant results in favour of WIs were not sustained across follow-up times.

Abbreviations: EBP = evidence-based practice; WI = workplace intervention; RCT = randomized controlled trial; OR = odds ratio; CI = confidence interval.

4.2 STUDY I

In study I, 345 descriptions (meaning units) of leadership qualities were identified, which were categorized into 78 distinct leadership qualities. The five most valued of these qualities were “ability to make contact”, “being considerate”, “being understanding”, “being empathic”, and “being appreciative”.

The 78 leadership qualities were further categorized into seven leadership types, which are presented in Table 6, defined on the basis of the 78 leadership qualities. The three most valued leadership types were as follows: the considerate, empathic, and protective type called the *Protector* (n = 87); the competent and problem-solving type called the *Problem-Solver* (n = 80), and the contact-making and interactive leadership type designated the *Contact-Maker* (n = 62). The subordinates more often described the *Encourager*, *Recognizer*, and *Protector* types, whereas the supervisors most often described the *Responsibility-Maker* and the *Problem-Solver*. Also, the youngest subordinates (aged < 45 years) wanted to be recognized (*Recognizer*) and encouraged (*Encourager*), whereas the oldest employees more frequently referred to supervisors who solved problems (*Problem-Solver*) and challenged the employees (*Responsibility-Maker*).

Table 6. Seven leadership types defined on the basis of the 78 leadership qualities

Leadership type	Definition based on the 78 leadership qualities
The Protector	Protects the employee, understands the situation, helps, and includes. Shows compassion, is discreet, warm, and friendly.
The Problem-Solver	Professional, solution oriented, and creative. Can, among other things, change the work tasks or in other ways adapt them so that the employee can continue to work. Takes responsibility and provides individual handling.
The Contact Maker	Gets in touch with the absent employee to inform about what is happening in the workplace. Is also interested in how the employee is doing, and proves to be a listening and able conversationalist.
The Trust Creator	Is discreet, predictable, attentive, honest, and open. Creates trust and a feeling of safety.
The Recognizer	Behaves in a recognizing and confirming manner, without prejudice towards the employee. Shows respect and confidence.
The Encourager	Has a positive attitude and is generous and cheerful. Motivates, inspires, and is available. This type of manager has a sense of humour and is also fair, patient, and encouraging.
The Responsibility-Maker	Assertive, fearless, challenging, and direct. Is honest and to the point, and is not afraid to establish boundaries or confront. Gives the employee challenges and responsibility that fit his/her own situation.

Together, the Protector and Problem-Solver represented the two-type combination that was reported most often. The triple combination indicated most frequently included the Protector, the Problem-Solver, and the Contact-Maker.

The mean number of descriptions of leadership qualities was 5.85 (SD 3.04, range 0–13), 5.50 (SD 2.98, range 2–12) for subordinates and 6.21 (SD 3.1, range 0–13) for supervisors. Fifty-three percent of the leadership qualities were mentioned only once (n = 25) or twice (n = 16). Of the 78 leadership qualities, only 10 were mentioned more than 10 times. Thus, this study revealed that there is a wide spectrum of valued leadership qualities.

4.3 STUDY II

In study II, eight female public sector employees on long-term sick leave due to musculoskeletal problems experienced mostly cognitive and emotional demands, and defined themselves as the work-demand claimers. These employees were subject to many highly complex work demands simultaneously.

Fifty-one work demands were described, only five of which were physical in nature. It was often felt that a large number of the demands interfered with work performance in more than one way. For example, the demands of being attentive were experienced as interfering in a positive, a neutral, and a negative way. All the informants had musculoskeletal disorders or diseases that might have resulted from physical demands in the work environment. Still, the employees on sick leave mentioned physical demands less often than non-physical demands, although the former were often described very clearly. Most of the negative demands consisted of emotional and cognitive challenges related to mastering the work tasks. The employees' descriptions indicating that work demands exerted positive, neutral, or negative effects on work performance showed that activities comprising physical demands were often perceived as negative.

Demands related to planning, organizing, structuring, and prioritizing work tasks were often viewed as negative, because they involved the pressure of being efficient and meeting deadlines. The employees had to be flexible and able to cope with stress, in addition to being service-minded and capable of handling conflicts and setting limits. This was described as the employees' choice between taking care of their own health and saving time. However, demands such as being able to organize one's own workload and being flexible and co-operative were also recounted as exerting positive effects on employee work performance. Moreover, the responsibility and professionalism in providing appropriate health care and interactions were experienced as positive work demands, as were the abilities to engage in appropriate interactions, be empathic, handle conflicts, and set limits. It was clear that the employees considered flexibility and variation to be positive factors when performing work tasks and routines, and also coping with stress. Being valuable to others was also mentioned as an emotionally positive demand in the work situation. Some cognitive and emotional demands were described as being only positive. However, cognitive demands that were experienced as positive could also be experienced as emotionally negative, and vice versa.

It was felt that most of the demands ($n = 36$) were made by the employees themselves, and that only a few were made by the employer/environment ($n = 7$), or by both ($n = 8$). Thus, the work environment was seldom seen as the source of demands, and, if it was, this was often in combination with one's own demands and those of the employer or the work environment. The work tasks and the work environment were viewed as given, almost rigid, conditions. Coping with stress, handling conflicts, dealing with a large workload, being pressed for time, prioritizing, being flexible, and showing perseverance were described as demands that the informants themselves made, and the same applied to organizing, structuring, and planning. Consequently, they attributed work-task failures mainly to themselves and seldom to the environment. Demands such

as managing daily routines, following procedures, and working within crucial constraints were described as coming from the employer and/or work environment. Other demands of external origin concerned variation in work tasks, the social and physical environments, and especially the need for efficiency.

4.4 STUDY III

Study III revealed ten challenges that arise when implementing EBP frameworks in a return to work process. Table 7 presents an overview of these challenges, including descriptions and possible solutions.

Table 7. Descriptions and possible solutions of the ten challenges that were revealed

#	Challenge	Description	Possible solutions
1	Sorting and subsuming into predefined categories	The patients in the studies often had simpler diagnoses than those seen in real life, which makes it difficult to use the evidence.	Allow multi-level interventions that target more than one diagnosis in RTCs and systematic reviews, since this reflects real situations in complex practices.
2	Degree of intervention flexibility	The interventions described in the RTCs are too rigid to be adapted to other persons.	Promote “frame-type” interventions with flexible elements that enable tailored interventions (such as supported employment).
3	Possibility of re-using interventions in new situations	Interventions in RTCs were not described thoroughly and are therefore hard to reproduce.	Provide descriptions of intervention programmes given in RTCs, in the Cochrane Library*, OTseeker*, and Pedro*.
4	Interventions available in the literature	The interventions used in practice are not the same as those in focus in the scientific literature.	Strengthen collaborative efforts towards practice to increase the adequacy and relevance of interventions that are tested in RTCs.
5	Translating average group results to individuals	It is difficult to apply the mean results to individuals.	Provide more information in published RTC-reports on characteristics of who did benefit from treatment and who did not.
6	Relevance of the outcome	In systematic reviews and RTCs, many interventions are considered and described as ineffective, but relevant outcomes are not assessed.	Based on ICF terminology, develop consensus regarding outcomes that should be used to report effectiveness of interventions.
7	Role of the scientific evidence	The role of scientific evidence seems to differ regarding whether it inspires, challenges, enlightens, informs, or determines the intervention decision.	Apply a wider understanding of the role of each type of evidence, deciding whether it should determine, inform, enlighten, challenge or inspire the decision making.
8	Aim of the interventions	The interventions seem to differ when the aim varies between rehabilitation, cure, and prevention.	Discuss further whether intervention decisions concerning preventive, curative, or rehabilitative aims do differ, and provide scientific knowledge about this.
9	Complexity of the interventions	The interventions in the studies were on a continuum from simple to complex, which could challenge the intervention decision in different ways.	Differentiate between simple and multi-level interventions, as the latter might challenge the translation process the most.
10	Potential to tailor interventions	The interventions in the studies seemed unequal, some being “good-for-all” interventions and others more tailored to individual participants.	Separate “good-for-all-interventions” from “tailored-interventions” as evidence might be applied differently in these categories.

Abbreviations: RCT = randomized controlled trial; ICF = International Classification of Functioning, Disability, and Health [102]. *The Cochrane Library, OTseeker, and PEDRO are databases containing RTCs and systematic reviews.

The evidence seemed to differ depending on whether it was from interventions with preventive, curative, or rehabilitative aims. Moreover, in some cases evidence appeared to originate from “good-for-all” interventions and in others from “tailored-type” interventions. Thus, it was revealed that there is a need to differentiate the role of the evidence in terms of whether it inspires, challenges, enlightens, informs, or determines the intervention decision.

In general, it seemed that the existing EBP steps and the PICO framework constructed a confined decision process. Therefore, revised EBP-steps, based upon results from this hypothetical case study were suggested (see study III).

In addition, one of the EBP steps (no. 3 Acquire) was to search for knowledge in the scientific literature. We searched The Cochrane Library to find articles about interventions for low back pain, and thus Study III gave results regarding the content of such interventions described in RCTs and systematic reviews included in the Cochrane database. This search and analysis revealed few workplace interventions, but a high diversity of clinical interventions. Table 8 shows the content of the identified interventions for low back pain.

Table 8. Interventions for low-back pain used in published international studies of effectiveness

Interventions listed according to type of study		
Target* (ICF)		
Body structure and body function (incl. psychological functions)	Cochrane Reviews/Protocols	Single studies: Clinical trials**
	Acupuncture, Antidepressants, Back schools, Behavioural treatment, Botulinum toxin, Chiropractic interventions, Disk replacement (total), Electrical nerve stimulation, Exercise, therapy, Herbal medicine, Injection therapy, Insoles, Laser therapy, Lumbar support, Manual therapy, Massage, Muscle relaxants, Neuroreflexotherapy, Non-steroidal anti-inflammatory drugs, Opioids, Patient education, Prolotherapy injections, Physical examination for lumbar radiculopathy, Radiofrequency denervation, Spinal manipulative therapy, Superficial heat or cold, Traction	Acupuncture, Aerobic training, Anterior discectomy, Anti-inflammatory drugs, ATEAM, Attentional strategi (pain fear), Auriculotherapy, Avinza, Baklosan, Balneogherapy, Biofreeze, Botulinum toxins, Calcitonin, Celecoxib, Chiropractic, Cognitive behavioural treatment, Comprehensive group training, Conservative treatment, Cyclobenzaprine, Depo-Medrol, Dexametopfen, Diclofenack, Dorsal ramus block, Drug therapy, Duloxetine, Dynamic-strength exercise, Education on return to work status (fear avoidance), Electrotherapy, Eperisone hydrochloride, Ergometric training program, Etanercept, Exercise (individual-group), Extensor strengthening program, Feldenkrais therapy, Fluoroscopic caudal injections, Functional restoration, Function-centred rehab, Fusion surgery, Graded exercise, Graded <i>in vivo</i> exposure, Heat therapy, Information booklet on pain persistence, Informative approach, Injection, Integrative medicine, Kuesu point, Laser, Leg lock brace, Lomoexicam, Lumbar fixation, Lumbar fusion, Lumbar support/belt, Lumbar stimulation belt, Magnetotherapy, Massage, Manipulation, Manual therapy, Meditation, McKenzie therapy, Mensendieck exercise, Microcurrent therapy, Mind-body program, Mobilization program, Motivation for self-care, Motor control learning, Movement training, Muscle relaxant, Muscle training, Naprapathic manual therapy, Neuropathic care, Neuroreflexotherapy, Nimesulide, Non-surgical treatment, Opioid therapy, Oscillating blade, Osteopathic manipulation, Oxygen-ozone therapy, Oxymorphone, Ozone therapy, Pain management, Physical strength treatments, Pilates, Piroxicam-beta-cyclodextrin, Pregabalin, Problem-solving training, Psychological intervention, Psychosocial education, Radiofrequency, Radiography, Reflexology, Roprotrotherapy, Sagittal spinal alignment, Sensory discrimination training, Spinal cord stimulation, Spinal manipulation, Spinal nerve root infiltration, Stabilization techniques, Stress management program, Stretching, Steroid injections, Surgery, Sustained-release morphine, Tai Chi, Tapentadol, Thiocolchicoside, Traction technique, Tramadol, Transdermal fentanyl, TENS, TTM-based motivational counselling, Yoga, Valdecocib, Water gymnastics, Wet-cupping
	Activity	Bed rest, Manual material handling advices, Physical conditioning programmes for improving work outcomes, Staying active
	Participation	Active sick leave
	Environment	Workplace interventions, Assistive devices
Combinations/others	Multidisciplinary biopsychosocial rehabilitation, General interventions for pregnant with back pain	Workplace interventions, Worksite visit, Chair interventions, Contextualized educational package
		Problem-solving therapy, Back schools, Behavioural rehabilitation programs, Biopsychosocial intervention, Classification-based physical therapy, Client centred therapy, Collaboration, Integrated care, Guidelines, Mini-intervention, Modern rehabilitation, Multidisciplinary rehab. Programs, Multistage RTW program, Occupational rehabilitation, Patient education, Physiotherapy, Rehabilitation programs, Therapy based on clinical guidelines, Treatment-based classification system, Innovative work related multidisciplinary program

* The identified studies were sorted according to the WHO ICF [102]**Including randomized and clinical controlled trials (RCTs and CCTs).Note: The search was done on 22 July 2010 in the Cochrane Library database, including the Cochrane Database of Systematic Reviews, and the Cochrane Central Register of Controlled Trials (CENTRAL), using low back pain or back pain in the title as the search strategy.

4.5 STUDY IV

In study IV, 306 condensed meaning units about workplace interventions were identified in various documents and focus group interviews. Based on similarity, these were categorized into 15 types of workplace interventions, which were divided into two intervention groups according to their targets in the organizations: nine *organizational-workplace interventions* (organizational workplace interventions) that targeted structures, processes and culture (n = 220 descriptions, 72%); six *employee-workplace interventions* (employee workplace interventions) that targeted persons (n = 86 descriptions, 28%). The workplace interventions were provided as ordinary organizational activities or as organized projects. The 15 workplace interventions are presented in Figure 6.

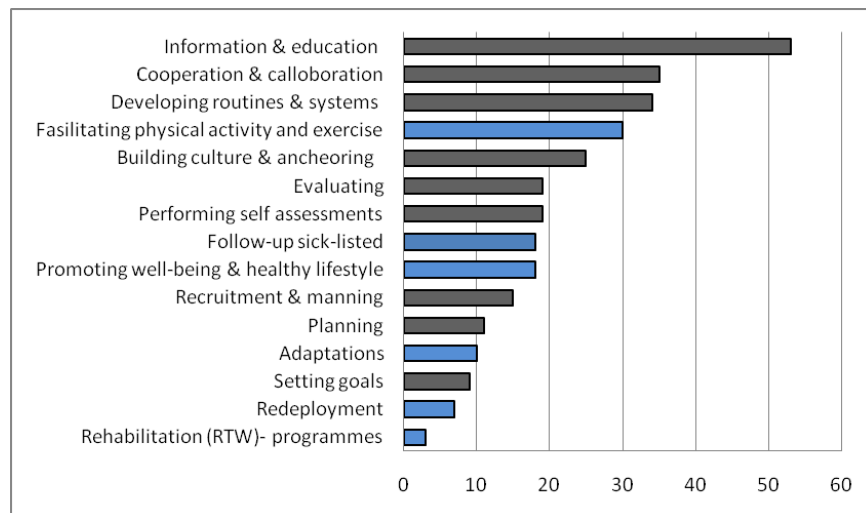


Figure 6. Number of workplace intervention descriptions within each of the categories resulting in 15 workplace interventions that were identified. The diagram illustrates employee-workplace interventions (blue bars) and organizational-workplace-interventions (black bars).

Many organizational workplace interventions were described, comprising four *process* organizational workplace interventions and five *structural/cultural* organizational workplace interventions. Such a WI involved running a process to reduce sickness absence within the organization, which ranged from assessment to evaluation. *Developing routines and systems* was connected with the general health and safety processes in the organization, including control of deviation from health and safety procedures, and systems for reporting and revision. The most frequently mentioned routines concerned follow-up of employees on sick leave. The informants further emphasized that *cooperation and collaboration* were crucial, and these entailed actions and systems for securing cooperation between stakeholders and actors in the RTW process. The standards that were mentioned were closeness, earliness, goal-oriented processes, and defined roles. *Information and education* were regarded as being provided on a regular basis. Rich descriptions of how, what, where, and towards whom these interventions should be directed were identified. Another important area was

building culture and anchoring. These efforts involved four important aspects: securing involvement, ownership, attitudes, and making people becoming conscious of the causes of high rates of sick leave. *Recruitment and staffing* involved how to organize recruitment of disabled and how to adapt a work environment that made it possible to retain work.

There were six employee workplace interventions: two that were primary preventive and four that were secondary preventive. *Well-being and lifestyle interventions* contained a spectrum of different social, nutrition, smoking, and welfare initiatives. *Facilitating physical activity and exercise* involved several types of exercise offers. *Redeployment* entailed providing alternative jobs or tasks. *Adaptation* comprised a few descriptions of how to adopt the physical environment or the working hours. *Following up employees on sick leave* included dialogue meetings and follow-up plans, both to be executed as early as possible; it was also recommended that extra follow-up be offered to risk groups such as employees on long-term sick leave, pregnant employees, and employees with mental problems. *RTW programmes* targeted employees who were on sick leave or were disabled due to musculoskeletal problems.

The intervention profiles in the organizations in the municipalities varied considerably regarding both the frequency and the content of the interventions. No plausible reasons for this dissimilarity were found. The three most frequent intervention groups were *information and education*, *developing routines and systems*, and *cooperation and collaboration*; these represented 40% of all interventions and 55% of the organizational workplace interventions. *Physical activity and exercise* together with *promoting well-being and lifestyle* constituted more than 50% of all the interventions in the employee WI group. Each organization's intervention profile varied greatly with respect to how many descriptions were given (mean 26, SD 14, min. 14, max. 51), and also regarding what type of intervention was planned or had been implemented. All but one of the included organizations gave descriptions of more organizational workplace interventions than employee workplace interventions.

The documents and the interview transcripts were further analysed to re-contextualize the interventions and to try to ascertain why the organizations' intervention profiles were so different. Some possible plausible explanations were found in the documents that were used as a source of data, but these could not explain all the variation that was revealed. When analysing the interviews, the most obvious reason appeared to be the large differences between the organizational competence with regard to inclusion of the aspects of working life related to ideology, goals and efforts, self-insight, consciousness, anchoring of the sick leave problem from top to bottom, proactive skills, and attitudes towards sickness absence and disabilities.

4.6 APPENDIX (STUDY V)

Study V was a Cochrane systematic review in which the literature searches identified 1,995 references. Ten RCTs (2,745 employees) were included in our investigation. Two of them were assessed as having low risk of bias (see Figure 7), and eight of them examined office workers, few of whom were on sick leave. Thus, workplace interventions were seldom designed to improve RTW.

	Adequate sequence generation?	Allocation concealment?	Blinding? (All outcomes - participants?)	Blinding? (All outcomes - providers?)	Blinding? (All outcomes - outcome assessors?)	Incomplete outcome data addressed? (All outcomes - drop-outs?)	Incomplete outcome data addressed? (All outcomes - ITT analysis?)	Free of selective reporting?	Similarity of baseline characteristics?	Co-interventions avoided or similar?	Compliance acceptable?	Timing outcome assessments similar?
Bernaards 2007	+	+	-	-	+	-	+	+	+	+	-	+
Fostervold 2006	+	+	-	-	-	+	+	+	+	+	+	+
Haukka 2008	+	+	-	-	+	+	+	+	+	+	+	+
Hedge 1999	+	-	-	-	+	-	-	+	+	+	+	+
Horneij 2001	+	?	-	-	+	-	+	+	+	+	+	+
Kamwendo 1991	+	?	-	-	?	?	?	+	?	+	+	+
Ketola 2002	+	?	-	-	+	+	+	+	+	+	?	+
Morken 2002a	+	+	-	-	-	+	+	+	+	+	+	+
van den Heuvel 2003	+	-	-	-	-	+	+	+	-	+	+	+
Voerman 2007	+	?	-	-	-	+	+	+	+	+	+	+

Figure 7. Risk of bias assessment of ten included studies

The workplace interventions were provided separately or as different combinations of intervention programmes. Altogether, six types of intervention combinations were used in six studies: one had four components [248], one had three components [249], and four had different combinations of two components [250-253]. Five studies provided single-component workplace interventions focused on mental health education[254], physical education, relaxation and breaks [251, 255], and physical environmental modifications [256, 257]. Table 9 presents an overview of the interventions in the ten included studies, using the authors' own terms and mapped onto uniform terminology of the ICF [102]. The included studies examined three types of interventions targeting the ICF the Body Functions domain: education for mental health, education for physical health, and relaxation/breaks. The mental health education interventions focused on behavioural change, stress management, and coping with high work demands. The other two types were combined into one group (see Table 9), because they both targeted musculoskeletal body functions, principles of ergonomics, anatomy, musculoskeletal disorders, and the importance of physical activity. They taught pause exercises, how to

use a relaxed work posture, proper positioning, the importance of rest breaks, and strategies to improve relaxation. Interventions targeting the Activity domain were seen less often, and these were described as modifying work tasks, workload, work techniques, work positions, and work hours. They were defined during group meetings or workplace visits. Interventions targeting the Environmental domain modified the physical environment, and they were often individually tailored subsequent to an assessment performed during a workplace visit or a group session that identified individual needs. Some of these (e.g., downward-tilting computer keyboards or screen angle modifications) were also given to all employees in the included workplaces. In most cases, several adjustments and alterations of the existing furniture and work equipment were provided. Education for physical health, relaxation, breaks, and physical modifications to the environment were the interventions examined most often in the included studies. No interventions targeted modifications of the two ICF domains social or attitudinal environments and participation or personal factors.

All ten of the included studies assessed pain as an outcome, and data were available for seven of those. In all the studies, there was low quality evidence that showed no significant differences between workplace interventions and no intervention for pain prevalence or severity. If present, significant results in favour of workplace interventions were not sustained across follow-up times.

Only three studies assessed sick leave as an outcome, and data were available for only one of those. There was moderate quality evidence (one study, 415 workers) [248] that a four-component WI was significantly more effective in reducing sickness absence in the intermediate term (OR 0.56, 95% CI 0.33 to 0.95), but not in the short term (OR 0.83, 95% CI 0.52 to 1.34) or the long term (OR 1.28, 95% CI 0.73 to 2.26). These negative findings might be explained by the fact that only a small proportion of the workers were on sick leave.

Table 9. The content of workplace interventions in ten randomized controlled trials

Study Intervention(s)	Detailed intervention descriptions according to ICF terminology				Dose
	Body function mental health education	Body function physical education and relaxation breaks	Activity modifications	Environmental physical modifications	
Bernaards 2007 Work style group (WS) Lifestyle physical activity group (WSPA)	WS: Increasing awareness of coping with high work demands, and adjusting workplace accordingly	WS: Awareness of effects of taking break, body posture, and workplace adjustments WSPA: Moderate to heavy physical activities			Six meetings, 15 to 60 minutes each, over 6 months. Trained counsellor and standardized protocol.
Fostervold 2006 Computer screen angle: high line of sight (HLS)/low line of sight (LLS)				15° lower (HLS) or 30° lower (LLS) than a horizontal line to the midpoint of the screen	Continuous change
Haukka 2008 Participatory ergonomic intervention (PEI)	Phase 1: Pre-implementation, active workshop to identify mental workload	Phase 1: Active workshop with ergonomic identification of risks and planning of solutions	Phase 2: Implementation of 402 ergonomic changes	Phase 2: Implementation of 402 ergonomic changes	11 months, six 3-hour workshops over 9 to 12 months
Horneij 2001 Workplace stress management group	Identify and reach goals and strategies for stress (from lack of social support, low decision latitude, high psychological work load)				12 groups (1.5 hours) seven meetings over 7 weeks + two follow-up meetings after 3 and 6 months; supervisors invited to two meetings
Hedge 1999 Downward-tilting keyboard on a tray				Downward-tilting computer keyboard on a tray	Continuous change
Kamwendo 1991 Traditional neck school (TNS) Reinforced neck school (RNS)	RNS: Interview by a psychologist regarding psychosocial work factors to create a personal coping strategy	TNS: Education about body function and ergonomics, including pause-gymnastics and relaxation		TNS: Workplace visit, discussion of ergonomic adjustments	TNS: 4 hours RNS: 4 + 2 hours

Table 9. Continued

Study/ Intervention(s)	Detailed intervention descriptions according to ICF terminology				Dose
	Body function mental health education	Body function physical education and relaxation breaks	Activity modifications	Environmental physical modifications	
Ketola 2002 Intensive ergonomics (IE) Ergonomic education (EE)		IE: Worksite visit; to take breaks during work and pay attention to work posture; active. Active participation of the employee. EE: Group training session: Encourage to take short pauses		IE: Worksite visit to outline layout environmental conditions of the workstation and adjustments of the workstation EE: Group training session to encourage employees to evaluate their own workstation and implement change, and ask for equipment if needed	IE: 1.5 to 2 hours EE: 1 hour
Morken 2002a Group sessions about coping with MSDs at the workplace		Group meetings on 10 different topics, such as MSDs and coping with symptoms of those disorders	Group meetings on 10 different topics, such as working techniques and positions	Group meetings on 10 different topics, such as optimal design of the workplace	10 meetings, three groups received the same interventions but included different stakeholders
van den Heuvel 2003 Rest breaks (RB) Rest breaks (RB) + exercise (E)		RB: Five minutes rest every 35 minutes introduced by a computer program. E: Four physical exercises			RB: 5 min rest every 35 min and 7 sec rest every 5 min E: Physical exercises of for 45 sec
Voerman 2007 Ambulant myo-feedback training (MT) Ergonomic counselling (EC)		MTEC: Instructed to relax in response to the myo-feedback	EC: Worksite visit including ergonomic investigation (work task, work hours, workload)	EC: Worksite visit including ergonomic investigation and modifying the existing work station	MTEC and EC: 4 weeks. MT: Sounds that are playing and heard when muscles need relaxation; ergonomic counselling weekly by a therapist

5 DISCUSSION

5.1 SUBSTANTIAL DISCUSSION

The *overall* aim of the present research was to explore workplace-based sick leave prevention and RTW regarding aspects such as workplace interventions (studies III, IV, and V), leadership qualities (study I), and work demands (study II). The intention was also to reveal challenges and possible solutions in translating scientific knowledge into intervention decisions in the RTW process (study III). The findings of the investigations are discussed in this chapter.

5.1.1 Leadership qualities

One of the current goals was to ascertain what leadership qualities were valued by employees on long-term sick leave and their supervisors, when the subordinates were in the process of getting back on the job. The most important findings were the identification of 78 distinct leadership qualities and, in particular, the qualitative descriptions of those features. It was also noted that the leadership qualities valued by the informants differed markedly, which might be explained by substantial variability in personal preferences, working tasks, and contextual factors. This suggests that each case should be addressed using a tailored approach, and hence that standardized leadership qualities will only meet the needs of a few. This observation is supported by the situational theories of leadership [83], which indicate that effective leadership depends on the ability to adjust to unique situations.

Another finding was that the leadership qualities described most often concerned being protected (e.g., the Protector), which implies that the ability to provide social support might be the most important characteristic of a supervisor. It appears that several of the leadership qualities revealed in this study represent different kinds of social support, which agrees with the four types reported by House [258]: emotional support, instrumental support, informational support, and appraisal. Notably, Johnsen [31] argued that social support is a basic need in the workplace and therefore added it to the often used demand-control model [54, 55]. This model, divided social support into that provided by supervisors and that given by co-workers, and the former included the supervisor paying attention, helping to get work done, and creating good teamwork [54].

Shaw and colleagues [259] investigated the employee's perspective on the supervisor's role in aiding workers after injuries, and they found that interpersonal aspects of supervision might be as important as accommodating physical work.

The employees considered here focused more on the Recognizer and Encourager than on the Problem-Solver or Responsible-maker, whereas their supervisors showed the opposite, most often describing the Responsible-Maker and the Problem-Solver. This disparity might be explained by the different roles of the subordinate and the supervisor. The supervisor is responsible for both the overall delivery towards management and all necessary adaptations, whereas the subordinate needs to protect

his/her own health status in relation to the demands of the employer. The two leadership types denoted Responsible-Maker and Problem-Solver were also more often described by those aged 45 years or older. This suggests that younger subordinates need more recognition, encouragement, and protection than their older counterparts in a situation involving sickness absence, although this assumption needs to be confirmed in large, representative studies. The need for a balance between relation-oriented and task- or action-oriented leadership has been described in leadership theories over the past 50 years [80-82, 84]. The current findings support such a dichotomy between tasks oriented leadership versus relation oriented leadership, but they also make relationships, tasks, and actions more specific (e.g., for solving problems and for ensuring that the employees take responsibility for their own health and sick leave situations). They even concern actions and relations aimed at protecting, recognizing, and encouraging employees on long-term sick leave.

5.1.2 Work demands

One objective of this research was to identify how employees on long-term sick leave due to musculoskeletal disorders described their work demands. The first finding in this context was that these employees mentioned mostly demands of non-physical origin (i.e., cognitive and emotional demands). Nonetheless, a few physical demands were stated in precise terms, and they were all experienced as exerting negative effects on work performance, although it was indicated that several of these also had positive effects. A previous study [260] showed that, regardless of their diagnoses, female employees on long-term sick leave often viewed the physiological pain connected with their illnesses or injuries as the main reason for their inability to fulfil their work tasks. This might also apply to our subjects who were employees on sick leave due to musculoskeletal problems, since these conditions are often associated with pain, which might increase in intensity when performing physically demanding tasks and thus cause the tasks to be perceived as impossible to carry out.

Most of the demands described by the informants were cognitive and emotional in nature. Indeed, all the participants mentioned emotional demands, which is rather surprising considering that results in the literature indicate that such demands are generally not strongly associated with either risk factors for [63, 129] or work absence caused by [261, 262] musculoskeletal complaints. However, it should be pointed out that emotional demands have been studied chiefly in relation to burnout, or to musculoskeletal problems in a few studies, even though there are indications that they may constitute a risk factor for developing shoulder and neck complaints [263]. Emotions have been suggested to play an important role in service work, because it requires interactions with clients and customers [264], and emotions have also been indicated as a risk factor for burnout [265]. Therefore, it seems that there is a need to broaden perspectives when studying demands in relation to musculoskeletal health and associated sickness absence. Furthermore, this conclusion is underscored by the present results, which agree with other authors' descriptions of demands in human service organizations [52]. Such organizations can be very complex and large, and hence they may produce associations between demands and complaints and sickness absence that are more complicated than is predicted by many of the traditional models.

The emotional and cognitive demands were perceived as exerting both positive and negative effects on work performance. A recent study in Sweden showed that positive feelings about work were associated with high work attendance in human services [266]. It has also been found that the psychosocial work environment has an important influence on whether employees can stay on the job [267], although the assessment tools used in that investigation focused mainly on physical factors.

The current results also suggest the importance of broadening the perspective of employees who are absent due to musculoskeletal disorders, which means that occupational rehabilitation should include all categories of demands that exist within a specific occupation. Furthermore, it was clear that the employees felt that work demands came from themselves, not from the employer or the work environment. This might have been due to the contextual situation in which they were working. Many demands stated as being made by an employee occurred within activities involving a client. Clients are considered to be a raw material in human service organizations, which has been described as follows: “the core activities of the organization are structured to process, sustain or change people who come under its jurisdiction” [268, p. 30]. This is illustrated by a recent study showing that teachers had high ideals for their relationships with their pupils, and they felt that their identities were related to their experience of this interaction and their intense ambitions and goals for their job [269]. When relations between an employee and a client become very important, the employee might place much of the responsibility for the performance of work on him-/herself, and trust his/her own abilities to a greater extent than would be the case in other occupational groups. This might lead to the work being perceived as the responsibility of the individual worker, which in turn could result in gradual deterioration of the person’s health and eventually give rise to long-term sick leave.

There are several potential mechanisms linking this individualized responsibility with such absence. Previous studies have found that the level of sickness presenteeism (i.e., working when sick) is higher for occupational groups within human services than for other groups, and that the rates of back/neck pain and fatigue are higher for those with more extensive sickness presenteeism [270]. Working when sick might impair recuperation, and it has been suggested that this can be an important mediator between job stressors and ill health [271], and also lead to prolonged sick leave. Another plausible explanation is that an individual employee who is given the responsibility for work tasks (e.g., dealing with clients) might disregard his/her own symptoms or neglect to mention them to superiors.

In the present research, the Model of Human Occupation [73, 74] served as a conceptual theory to aid understanding of work demands, and the Worker Role Interview [225, 228] and Work Environment Impact Scale [226, 227] based on this model were used as the qualitative assessment tools. The Model of Human Occupation is a framework that can help explain disabled workers in their environments [76], and thus it provides a holistic approach to work-related rehabilitation [77]. The demand-control model [54, 55] has most often been used to assess demands determined by the environment [51], and thus it would not have produced the same results in our study. More specifically, the large number of emotional demands described by the participants would probably not have been captured, since they are not included in the model. This might also apply to the

large number of demands made by the employees. If this finding is related to the context rather than health in organizations where the outcome is based on individual employee-client relations, it is possible that demands on work performance exist other than those defined externally. Perhaps such demands are related to underlying norms and values for the profession or occupational group, and thus they might not be easily captured by traditional epidemiological methods. In a study considering job demands and sickness absence among employees in the public and private sectors in Sweden [43, 68], it was concluded that the demand-control model was better at predicting sickness absence in the private sector than in the public sector. This might be explained by failure of the model to account for the special challenges that face employees in human service organizations, which should be taken into consideration when attempting to identify risk factors for and causes of absence, and when attempting to facilitate RTW within these organizations.

5.1.3 Workplace interventions

Three of the studies included in this thesis focused on workplace interventions aimed at preventing sick leave and promoting RTW. These are discussed from the following four viewpoints: (1) contents and types of workplace interventions (studies III, IV, and V); (2) frequency and profile of workplace interventions between organizations (study IV); (3) combinations of workplace interventions for individuals and organizations (studies III, IV, and V); and (4) effectiveness of workplace interventions (studies IV and V).

5.1.3.1 Contents and types of workplace interventions

Study IV was conducted to identify the workplace interventions that twelve municipalities planned and/or implemented to reduce sick leave rates among all employees in primary health care, schools, and kindergartens. In Study III all types of interventions reported in international investigations about effectiveness of interventions targeting low back pain were identified. The systematic review (study V) was carried out to identify the content of the workplace interventions targeting employees with neck pain in the 10 included RCTs. All three of these investigations indicated that the interventions comprised comprehensive and highly varying measures intended to prevent sick leave and promote RTW, as discussed further below.

Study I identified 15 workplace interventions: nine of these were designated *organizational workplace interventions* and targeted structures, processes, and culture; the other six were denoted *employee workplace interventions* and targeted people. The attempts to reduce sick leave made by the 12 organizations included in this investigation provided us with 306 highly variable descriptions of employer-implemented workplace interventions. Surprisingly, more of these were *organizational* than *employee-oriented* in character, and those of the latter type were few and limited. Seven of ten descriptions (meaning units) were about *organizational interventions*, that were dominated by *information and education*, *cooperation and collaboration*, and *developing routines and systems*. The organizational interventions were described as requiring continuous pressure over time in order to be effective, which means that a willingness to earmark the needed resources for this sick-leave-preventing work might

require dedicated and goal-oriented leadership to be successfully implemented [206]. Egan and colleagues [272] reviewed the literature to determine how complex social interventions aimed at promoting health are put into effect, and they found four types of workplace initiatives in 103 studies: employee participation, changing job tasks, changing work shifts, and shortening work weeks. None of these were extensively represented in the present research.

Few organizational workplace interventions were found in the literature (studies III and V). Study IV analysed the 150 different types of employee-targeted interventions for low back pain that were available in the Cochrane Library, most of which were clinical in nature and primarily concerned drugs, physical exercise/therapy, and psychological/cognitive therapy. Also, according to ICF [102], as many as 90% of these interventions targeted bodily structures and functions rather than activity, participation, and environmental aspects. Only a small number of investigations about effective reduction of low back pain concerned interventions provided in the workplace. Study V included a content analysis of the interventions used in the 10 RCTs, most of which focused on musculoskeletal functions, although some were intended to modify the physical environment. However, these interventions varied considerably with regard to specific content, duration, intensity and methodology, and they also differed substantially from those found in studies III and IV. Educational approaches dominated, and they concerned stress management, principles of ergonomics, anatomy, musculoskeletal disorders, and the importance of physical activity. They taught pause exercises, how to use a relaxed work posture, proper positioning, the importance of rest breaks, and strategies to improve relaxation. Some investigations also included how to modify work tasks, workloads, work techniques, working positions, and working hours. Several studies suggested how to make adjustments and recommended alternatives to the existing furniture and equipment in the workplace.

It might be assumed that an organizational workplace intervention is a prerequisite for an employee workplace intervention. For example, an organization that has high competence in disability management [24, 26, 28, 29] and well-developed follow-up routines for meetings and cooperation with social insurance and general practitioners might be well prepared to provide a workplace intervention aimed at facilitating RTW for individual employees. Literature reviews have shown that cooperation between health care and workplace actors is important to promote RTW for employees on sick leave [38, 94]. In the 12 municipalities included in study IV, employee workplace interventions were seldom mentioned and only sparsely described, with the exception of the initiative designated *physical activity and exercise*. Employee workplace intervention as *adaptations* was mentioned in only five of the 12 municipal organizations, even though this type of measure is often seen as a key to enabling employees to manage their work despite an existing disability or pain, fatigue, or some other disorder [50, 91]. Anema and colleagues [50] found 60 types of workplace adaptations in use in one RTW programme [50]. *Return to work programmes* was mentioned by only two of the organizations in study IV. Well-designed RTW programmes have been proven effective in reducing sick leave [38, 93, 95], but none of those were included in the programme described in study IV, possibly because the actors in the municipalities had no knowledge or evidence of these interventions.

The descriptions of interventions concerning follow-up of employees on sick leave were not as limited. However, they concerned formal, more technical aspects such as applying routines, holding dialogue meetings, making follow-up-plans, and conducting discussions, and they did not consider the content, competence, or components of the interventions. A possible reason for this lack of emphasis and descriptions is that the RTW programmes and adaptation were supported by other stakeholders, such as the occupational health service personnel, GPs, other health care workers, or the social insurance office. However, if that was the case, it should probably have been discernible in all the documents and interviews, for example, as a description of a workplace visit for all employees on sick leave for more than four weeks, which has been shown to be effective in promoting RTW [38]. All 12 organizations in this project were also required to develop a plan regarding their intended and ongoing sick leave interventions, and to present this plan to everyone in their networks. Under these circumstances, it would be natural to be eager to include all current or envisaged efforts. The participants were also given the opportunity to correct their plans after they had been analysed by the scientists, and they all confirmed the contents.

So how could these interventions be designed so differently? Was it due to pronounced disparities in the aims of the interventions, the groups targeted by the interventions, the competence of those who designed the interventions, or the context in which the interventions were implemented? All these alternatives might be relevant, but it seems that they can explain only part of the variation found. Is it possible that we in general lack a total overview of what interventions are available to choose from, so that intervention packages are selected at random? At the same time, it is also apparent that these workplace interventions in the 12 municipalities differed markedly from the content of the interventions in the 10 RCTs targeting neck pain (study V) and the 150 lower back pain interventions found in the Cochrane Library (study IV). One reason for this might be that the interventions used in the investigations found in the literature were designed by researchers and health care clinicians, whereas the interventions in the 12 municipalities were developed by workplace actors. Perhaps a guide for designing RTW-promoting programmes is needed.

Still, the amount of literature considering the content of workplace interventions has increased, and the authors are describing what they call workplace interventions, workplace RTW interventions, RTW interventions, RTW programmes, workplace-oriented interventions, work rehabilitation, or multidisciplinary programmes [37, 38, 91, 93, 95, 97, 101, 139, 146, 273]. But does the use of different terms indicate differences in the content of the interventions? This variation might be due to the traditions of the researchers to use different terminology to describe essentially the same type of interventions.

It seems that the interventions reported in the literature have been designed primarily to promote fast and sustainable RTW for employees who are on long-term sick leave, often due to musculoskeletal disorders and comorbidity [115, 116]. The target groups we found in our studies were broader and also included employees who were not on sick leave but had pain (study V), as well as those who were only at risk of health problems and sickness absence (study IV). Thus the results of these investigations might widen the perspective on what workplace interventions are and can be in real life. This might

help enable us to be more successful in differentiating between these type of interventions in the future.

5.1.3.2 Frequency and profile of workplace interventions between organizations

Study IV revealed large differences between the 12 municipalities with regard to the number of interventions used or planned. It is striking and surprising that this initially supposedly joint network could end up with such variation in the design and implementation of interventions. While three of the organizations had 44 to 50 intervention descriptions, five others had only 14 to 17. Obviously, this could not have been a random occurrence, but another plausible explanation is that more detailed descriptions were given when there were many interventions to describe. However, that assumption is not supported by the data. In short, even though the meaning units were unequal with respect to how well they were described, no systematic difference could be discerned between the organizations. Another explanation might be that the number of intervention descriptions varied due to different needs and possibilities within the organizations. For example, perhaps the smaller organizations needed fewer interventions, or they might have had less resources for developing interventions compared to the larger organizations. This pattern was not observed in the data, nor could any rationale for this large variation be found in the reasoning behind the intervention choices. Thus it seems that this cannot be explained as arising from disparate needs in the different organizations.

In the often-used PARiHS framework, successful implementation of intervention programmes is seen simply as a function of the interrelation between three key components: evidence, context, and facilitation [204-207]. In the national 12-municipality programme in Norway (study IV), the context was developed to be ready for implementation of workplace interventions and was facilitated by creation of a national secretariat including experience-based knowledge on implementation. However, evidence was not available for the programme groups in each of the 12 organizations, and therefore the type and number of interventions to be implemented were chosen randomly. This might explain the differences between the organizations. Nevertheless, they were supposed to learn from each other in a network model, although the experiences shared about interventions were not based on evidence.

5.1.3.3 Combinations of workplace interventions for individuals and organizations

Complex problems might require multifaceted interventions. This is reflected in the variation in the combinations of implemented interventions that we found both between the organizations (study IV) and between individual employees (study V). Study IV revealed that only two of the 12 organizations had described 14 of the 15 types of workplace interventions, and one organization had described only seven. Some were especially focused on one intervention, as exemplified by municipality I, for which half of the intervention descriptions concerned *physical activity and exercise*. The balance between organizational and employee workplace interventions also varied. Some of the municipalities had almost no employee interventions, even though they had a wide range of organizational interventions. Also, organizational interventions constituted 95% of the descriptions in one municipality but only 35% in another. The reason for

this discrepancy might be that the municipalities were not aware of this imbalance, because they lacked the overview that was provided by the intervention terminology retrieved from our study. This intervention practice might be described as “groping in the dark”.

Study V even considered the number of components that each of the ten included RCT-studies had. Six workplace interventions were found to comprise more than one component, and some also included clinical or health care interventions together with workplace interventions. There were both single and compound interventions, and there were differences regarding whether the interventions were adjusted to fit the needs of individuals or standardized and/or delivered to groups. All workplace adjustment strategies were to some extent individually tailored based on existing knowledge or experimental ideas. Notwithstanding, educational approaches were used in most cases, although it might be questioned whether education alone can suffice to change behaviour, or if this strategy should be combined with other types of intervention components. It seems that many of the interventions in the 10 RCTs were not based on cumulative traditions, and that some of the tested interventions were founded on hypotheses and models that were developed on an ad hoc basis rather than using previously published evidence. In addition, few multi-targeted interventions were conceptualized. It is possible that use of the ICF[102] contributed to a conceptual frame of reference grounded in a common multidisciplinary terminology.

The research findings that are available today give few answers about what combinations of organizational and employee workplace interventions are most effective in reducing sick leave rates. We also need to know more about what combinations of workplace and clinical interventions can be beneficial [34, 40, 93].

5.1.3.4 Effectiveness of workplace interventions

This research revealed two types of initiatives, which was designated organizational workplace interventions and employee workplace interventions. The findings of the analysis of intervention studies in the literature (Studies III and V) suggest that there is only limited evidence of the success and implementation of *organizational workplace interventions*. This is simply due to the observation that few studies reported in the literature have focused on this type of workplace interventions, which might make it difficult to apply EBP. By comparison, employee workplace interventions were more common in the literature, even though clinical interventions were most abundant. Study IV revealed two types of employee workplace interventions: those aimed at preventing health problems and/or sick leave, and those intended to promote RTW.

The objective of the present systematic literature review was to examine published investigations to determine the effectiveness of providing workplace interventions as compared to offering no treatment, ordinary care, or other workplace initiatives to adult workers with neck pain. Mostly preventive employee-focused interventions were used in the 10 included RCTs, and these were aimed primarily at preventing symptoms such as pain and also sick leave in some cases. Accordingly, the present results almost exclusively concern the effectiveness of employee workplace interventions in preventing symptoms in employees with neck pain. We found mainly low quality

evidence that indicated no significant differences between workplace interventions, and no interventions for pain prevalence or pain severity. None of the significant results favouring workplace interventions for pain were sustained over different follow-up times. Only one investigation (comprising 415 workers) had data available on sickness absence, and it provided moderate quality evidence that a four-component workplace intervention was significantly more effective in reducing sick leave in the intermediate term, but not in the short or long term.

Considering outcomes of symptoms, we scrutinized the publications included in our review to find relief of neck pain in employees. The prognosis and the effects of treatment are generally less optimistic for neck pain than for low back pain [1-4]. However, several risk factors have been identified in relation to intensive computer work, such as keyboard position with small elbow angles, inadequate mouse position, high screen placement, and chairs lacking arm rests [5]. The incidence of health problems in workplace settings is also affected by psychosocial factors such as high demand, low control, and low support at work [6]. Thus it seems that interventions intended to deal with these factors should reduce neck pain, but unfortunately the findings of the present review provide no strong evidence that using primarily educational workplace interventions and environmental physical modifications can achieve that goal. However, the results should be interpreted with caution considering the small number of studies and participants included in the analysis, and because only two of the ten studies had a low risk of bias. A review focused on computer users conducted at the Institute for Work and Health in Canada provided moderate evidence that workstation adjustments and rest breaks, together with exercise, had no impact on pain symptoms, whereas alternative pointing devices had a positive effect on such symptoms [7]. However, the findings of that review with respect to various ergonomic interventions were inconsistent or gave insufficient evidence. Another Cochrane review that concerned several types of musculoskeletal disorders also found that workplace interventions failed to reduce symptoms [8]. It appears that it can be difficult to apply the risk literature directly in the design and implementation of interventions in a complex context such as the workplace.

According to the PARiSH framework, successful implementation is a function of the nature and type of evidence, the qualities of the context in which the evidence is being introduced, and the way the implementation is facilitated [9-13]. If the context is not readily or actively involved, it seems doubtful whether workplace interventions alone can result in a sustainable effect. A literature review of the health effects of workplace interventions revealed a lack of reporting on how the interventions were actually implemented [14], and such information might be essential when introducing workplace interventions in the future.

When discussing the research results concerning sickness absence, it is important to keep in mind that the effort of preventing sick leave was not expressed as being of high priority in any of the studies included in our review, and that few of the participants in the studies were actually on sick leave. It seems unrealistic to expect to be able to reduce a nearly non-existent phenomenon like sickness absence, and yet one of the included studies with low risk of bias [15] did report a significant finding about such absence. However, the outcome measure used to assess sick leave in that investigation

did not capture the total frequency of lost days (the result was based on proportions of employees on sick leave for a three month period, not hours/days of absence). This is discussed further in the section on methodological considerations.

Studies focused on measures used to help employees in the workplace often call them RTW workplace interventions. Are those comparable to the workplace interventions provided in the studies included in our review? RTW workplace-based interventions have been observed to significantly reduce sick leave [8, 16, 17]. In a review of 10 studies of employees off sick due to musculoskeletal disorders or other pain-related conditions, Franche and colleagues [17] found strong evidence that RTW was significantly improved by work accommodation and early contact between health care providers and the workplace. In addition, those investigators obtained moderate evidence that such improvement was achieved by the workplace making early contact with the absent employee, ergonomic work site visits, and the presence of a RTW coordinator.

It is also possible that the content of the interventions in the 10 RCTs we analysed did not properly target the problems that the workers had. Can the variety in the content of workplace interventions (discussed in section 6.1.1) explain why the results of different studies vary so widely. This possibility needs to be explored further.

The determinants of sick leave are complex. Any attempt to understand them must take into account interactions between individual and environmental factors and how tasks are executed [18-20] over a large variety of occupations. Therefore, effective interventions may represent a combination of processes that require interaction between employees, employers, health professionals, and the employment system [21]. With the growing evidence base supporting RTW workplace interventions, should we consider whether there ought to be more interaction between RTW-workplace interventions and RTW-clinical interventions when designing new, more efficient workplace interventions? Guidelines for dealing with musculoskeletal disorders include most often measures aimed at symptom reduction, and therefore do not offer many recommendations for workplace interventions [22].

A challenging but necessary task for the future will be to implement effective organizational and collaborative workplace interventions for those who stay on the job despite being in pain.

Another explanation for the observed disparities might be that the groups targeted by the interventions were not the same in the studies included in our review as in investigations that have found positive effects of workplace interventions. In the literature reporting positive results of such interventions [8, 16, 17, 23, 24], the target groups were mostly employees on sick leave, and often those on long-term leave (different durations). Many of the people in the indicated target groups also had prolonged or chronic musculoskeletal disorders, or common mental disorders, whereas the subjects in our review were chiefly office workers with neck and sometimes also shoulder pain, few of whom were on sick leave. This finding implies that workplace interventions might be more effective for reducing sick leave rates than for relieving symptoms such as pain, a suggestion that is supported by another Cochrane review

focused on workplace interventions for preventing work disability [8]. They found that, compared to ordinary care, workplace interventions could reduce sick leave but did not affect health outcomes. Four studies provided moderate quality evidence for the outcome “time until first RTW” in workers with musculoskeletal disorders. In contrast, few of the workers in our 10 RCTs were off sick, and only three of the RTCs assessed sick leave as an outcome. This means that our review did not have the premises to expect conclusive results in the form of sick leave reduction.

In another review including 31 studies of 28 different workplace interventions aimed at reducing low back pain [25], it was found that only exercise had a documented effect on sick leave, and multidisciplinary interventions had an impact on pain. The authors of this review claimed that their results showed that there was a good reason to be careful when considering workplace interventions aiming to prevent low back pain among employees. If workplace interventions are mostly unsuccessful in reducing pain and more often effective in promoting work participation, this might be important when applying these very common interventions. Further high quality studies are needed to compare these two outcome measures.

5.1.4 Challenges in evidence-based decision making

The objective of study III was to reveal challenges in translating scientific knowledge into intervention decisions in the RTW process, and to suggest possible solutions to these challenges. The main goal was to obtain a deeper understanding of the EBP translation process by using the recognized components that are available to perform EBP. In a way, study V was part of the delivery chain for EBP, because it produced a systematic review that can be used in this decision-making in practice.

Since the end of the 1990s, EBP has been an increasingly prevailing paradigm in the health services. The perspectives arising from EBP also stimulate countless inspiring discussions about ontology, epistemology, and methodology in a real and complicated context such as the workplace. There are many challenges in the associations between individuals on long-term sick leave (often complex cases), the workplace, and various actors and stakeholders such as health care personnel. One such perspective is the need for tailored interventions to deal with decisions about individuals on sick leave.

Even though the rehabilitation professional in the hypothetical case study were confident in implementing EBP, she encountered both technical challenges as well as more fundamental or normative challenges. In general, forcing the EBP steps created a decision process that was limited to producing valuable and important knowledge from one type of literature (guidelines, systematic reviews, and RCTs). All other types of knowledge needed for decision-making were not an output of forcing the EBP steps and using the PICO framework. It seems that the patient’s knowledge and preferences and the professional’s expertise are taken for granted and thereby under-communicated by these tools. Sestini [177] has argued that the EBP process is based on Popper’s criterion of falsification, objective knowledge, and absolute truth. Porzolt et al. [185] reported that when these EBP steps were used in training of medical students, the teachers noticed a growing reluctance of the students to accept this strategy as they progressed in their education. Even though EBP facilitators advocate that EBP

represents more than guidelines, systematic reviews, and RCTs, it seems that we need a better strategy for integrating scientific evidence with expertise and patient knowledge. It is frequently assumed that the practitioner can apply scientific evidence to a real patient directly and literally, without any further effort, as if by magic providing the answer to what intervention should be used in that particular case. EBP often supports a “copy-and-paste” action rather than a demanding process, and it becomes confused if this is not actually possible. As Erikson claimed [274], EBP will never work in the field of human services. Considering practices from the perspective of episteme, rather than phronesis, is not to view them as actual practices, but only as general characterizations of practices.

Our hypothetical case study shows that the goal of the intervention appears to decide the role of evidence, and it also appears that the complexity of interventions, together with the aim of those measures, has an impact on the translation process.

While the Cochrane Collaboration is working hard to ensure the quality of scientific work, we might stop to wonder if we have got lost in translation and need a map [203]. It might also be commonly believed that EBP gives easy answers, whereas in real life this process often raises new questions. At the same time, we have also experienced that scientific knowledge from systematic reviews and RCTs has contributed new perspectives that have unquestionably had a positive impact on the insight of the practitioners. The challenges revealed by the present research suggest that we should differentiate more extensively between different types of evidence that come from interventions with a preventive, curative, or rehabilitative aim. Furthermore, this study that we should distinguish between evidence that is useful only for inspiring the intervention decision and evidence that is useful for determining the intervention decision.

The current Cochrane review (study V) identified a need for more high quality RCTs, but can such trials really aid decision making performed in complex contexts? The lack of differentiating the role of evidence in decision making might have led to overestimation of the importance of RCTs in intervention research. When adapting experimental design to decisions in complex cases, the contexts will surely influence the outcome. If scientific knowledge is to inform and inspire decisions, rather than determine them, different types of intervention research might become more valued than they are today. For example, a single case study reporting in detail a treatment that was successful for one patient could inspire and inform, and in this manner influence the intervention decision in a positive way. It would be easier to interpret case studies as informative, because they would not “pretend” to have a determinative role that should be directly transformed into intervention decisions in specific cases. The quality of the investigations is the main concern for the future, and, for example, it has been claimed by Rosen that high quality observational studies almost always provide results that are equivalent to those obtained in RCTs.

Study III revealed that there is no “quick fix” in complex practice, and that we need to reconsider the role of scientific evidence in intervention decisions. If this is true, then there is a strong need to explore decision making as a phenomenon and focus not only on whether it works, but also on how, when, and why a positive change occurs in the life of the clients. Miles and colleagues [275] have asserted that evidence-based

medicine is losing its influence, while the promise and potential of personalized medicine are being increasingly recognized. The development of decision making in the field of workplace rehabilitation should include the role of scientific evidence in high quality intervention decisions, although this requires further discussion. By focusing too extensively on maximizing the percentage of patients who benefit from care according to current scientific evidence [176, 188, 276], we tend to forget that, in specific cases, other types of knowledge might be superior to scientific evidence when all the available information has been appraised.

5.2 METHODOLOGICAL CONSIDERATIONS

5.2.1 The case studies using content analysis

5.2.1.1 Investigation of 30 employees on sick leave (studies I and II)

Some considerations about the sample are necessary. A limitation of study I was the lack of knowledge about non-responders and the fact that we were not permitted to obtain information about all the employees who were invited to participate. To ensure anonymity, the Ethics Committee in Medical Research did not allow us to ask for the reasons why potential subjects decided not to participate in the study. Therefore, we were unable to give descriptions of those who declined to take part.

The informants in study II were eight employees selected among the 30 workers on sick leave who were included in study I. The selection criteria stipulated that the individuals had to have musculoskeletal disorders, and they also had to be employed within a specific group of occupations in a certain type of organization, namely, human services with histories and experiences that might be relevant for all workers in such organizations. This means that it might not be possible to generalize the results concerning work demands to other types of health conditions and sectors.

These two studies focused explicitly on the employees' and supervisors experiences of leadership qualities and work demands, and the data were collected in qualitative interviews. The strength of this method lies mainly in its capacity to generate a wide range of descriptions, which helps to explore diversity [277] and also provides an internal validation of the results through unaltered quotations that represent the employees' authentic voices. The articulated experiences of the informants are not necessarily those used in practice, and this is a general risk in all studies in which the results are reported rather than observed. The reliability of our informants depended on how well they understood the questions and how much they believed that their confidentiality would be maintained [277], especially considering that they had been recruited through their company. The informants were allowed to choose where to the interviews were to be conducted, which gave them some degree of co-determination. It has been shown that qualitative interviews are strongly influenced by the relationship that evolves between the interviewer and informant [229], and hence it was considered an advantage to use more than one interviewer with different strengths and weaknesses (to complement each other). To ensure that the voices were as authentic as possible, any laughter, crying, hesitations, and strong outbursts were noted in the texts during the transcription process. Analyses were discussed and executed in cooperation involving

at least two of the researchers. Any disagreement was discussed with close reference to the texts, and, if it persisted, an additional researcher was consulted.

Content analysis is often used [209, 217, 221-223] in projects that apply both qualitative and quantitative techniques. In that way it is similar to case study methodology [216, 219, 220, 278], which makes it easy to combine the two methods. In studies I and II, the first phase of the analysis was qualitative, with the aim of exploring new terminology of the phenomenon under investigation. The qualitative results from this work need to be explored and replicated in other sectors and branches. The seven leadership types in study I were constructed qualitatively by face similarity, and factor analysis must be performed in a larger quantitative investigation to ascertain whether these are indeed seven different types.

Counting meaning units is often done in content analysis, simply to be able to raise a hypothesis concerning possible connections and patterns, which must be further explored in larger, representative surveys [222, 223]. Statistical generalization is neither desired nor possible, since the sample is not representative of a population. Therefore, counting informants does not provide valuable knowledge. Despite the need to substantiate our results, theoretical generalization can be suitable and of interest. Another limitation regarding generalization is the extent to which our observations made in Norway are relevant in other parts of the world. The interaction between subordinates on sick leave and their supervisors is a universal topic concerning human relations, and the same applies to work demands, even though these might be highly influenced by the structure and culture in working life. It might be claimed that the culture in companies is informal in Norway compared to other Western societies, and the Nordic model of the tripartite cooperation between the unions, employers and government might influence the relationship between subordinates and supervisors. Still, most of the present results might be relevant for other Western countries as well.

5.2.1.2 The hypothetical single case study

The design of study III was original, and thereby challenging. It did not use traditional case study methodology, nor did it lead to a case study report. The referees for the publishing journal referred to the methodology as being innovative. Even though the entire case study was hypothetical, it did include several “real” components. The case was constructed based on core characteristics of 30 employees on long-term sick leave. The EBP steps, the PICO approach, and all the scientific evidence from the RCTs was authentic, although the 10 challenges were revealed through a theoretical analytical process. Nevertheless, it seems that the results and findings can be generalized theoretically, and they should be looked upon as a hypothesis that must be further explored and tested empirically in larger scale representative studies.

5.2.1.3 The case study of 12 municipalities (study IV)

This case study used both data from interviews and documents, and since such sources of information can be supplementary, data triangulation represents a potential strength. A possible limitation of this investigation is that only 12 organizations were included. That number is too small to represent true inter-organizational variation, which might reduce the external validity. Another potential weakness concerns whether the

documents and interviews actually reported all interventions that were planned or implemented. The level of intervention reporting is an additional problem when using this type of data; here, some interventions were reported merely on a broad level, as headlines, whereas others were described in detail. This is also a problem when quantifying meaning units. Still, in our data, it seems that this inequality was spread between the different types of interventions and between the organizations, and thus it did not represent a systematic misalignment. Two interviews were not taped and transcribed, and therefore we had to analyse written memos; this might have reduced the level of detail in the descriptions provided by the participants in these two focus group sessions. The cases used in this study were selected by three government offices and the employer organization, not by the researchers. However, inasmuch as heterogenic inclusion strategies were chosen, we do not regard this as a potential bias in this type of research. The sample was not recognized and presented as being representative.

New investigations might not give diverse results on the highest levels of the terminology developed in this study, which were as follows: level 1, intervention types (e.g., organizational and employee workplace interventions); level 2, intervention groups (e.g., information and education, adaptations, RTW programs). Theoretical generalization on these levels might be possible, although further investigations in other cultures, sectors, and branches will probably contribute to more diversity on the lowest level (level 3) called intervention descriptions.

5.2.2 The Cochrane systematic review

The GRADE analyses revealed that these studies provided mainly low quality evidence, which means that further research will very likely have an important impact on the confidence in the estimate of effect, and will probably change the estimate. As expected, blinding is a challenge in this type of research, and, due to the nature of these interventions, it is not possible to blind health care providers or participants. Thus it is impossible to avoid any influence that their expectations might have on the effect of the interventions. However, there should be nothing to prohibit blinding of the outcome assessor, but, despite that, less than 50% of the studies provided blinded outcome evaluation. Incomplete outcome data, low compliance and differences in baseline characteristics of the participants also introduced a high risk of bias in several of the included studies. The number of participants in each intervention was low in several of the investigations. In addition, the diversity of settings, participants, and interventions hampered pooling of data and the overall robustness of the evidence gained from results repeated across studies. Furthermore, the diversity of primary studies regarding interventions and outcomes represents a typical challenge to conducting meta-analyses of workplace interventions in general [279].

A limitation in using sick leave as a main outcome in our material was that few of the participants in the ten studies were on sick leave. Thus the significant results regarding sick leave were promising, considering that a study by Haukka and colleagues [248] had a low risk of bias and also used a broad four-component intervention based on evidence from participatory ergonomics methodology with high involvement of stakeholders [50, 93, 98, 99]. Nonetheless, two methodological limitations of our findings require

discussion. First, the outcome prevalence of musculoskeletal sick leave past three months was used to measure sick leave. The significant results at six-month follow-up showed that 28 of 216 employees in the intervention group and 41 of the 196 in the control group had had one or several days of this type of sick leave during the past three months. Separating musculoskeletal sick leave from sick leave for other reasons can be a complicated task, especially because the choice of not going to work is affected by many different aspects simultaneously [49], and also because of comorbidity. Another limitation concerns counting events for only the previous three months, which might also have restricted the results. This outcome measure does not show the numbers of days or hours these persons were off sick. If, for example, days or hours lost during the whole period from baseline to six months had been cumulated, the results would have been more valid, if the aim was to know how to prevent sick leave. These observations were made in a study of kitchen workers, whereas most workplace interventions targeting neck pain concern computer workers, and this may further reduce the clinical relevance and generalizability of the results.

There is no universally accepted definition of workplace interventions. In the present review, the main prerequisite was that an intervention was conducted in the workplace. Obviously, interventions that aim to modify physical or social and attitudinal factors in the work environment cannot be applied elsewhere. However, it can be feasible to conduct modification of personal factors such as exercise and other health promotion activities outside the workplace. It appears that no studies have been performed to compare the effectiveness of interventions across the settings, that is, both within and outside the workplace.

Our inclusion criteria stipulating that at least 50% of the participants in both the intervention and control groups were to have had neck pain at baseline represents another potential source of bias. Would the results have been different if the review had included only studies in which all or 75% of the participants had neck pain at baseline? Even though some of these investigations included only participants with neck pain, some of the subjects had not had such discomfort at baseline due to the fluctuating nature of neck pain.

6 CONCLUSIONS

The results reported in this thesis revealed substantial variability in the terminology related to leadership qualities, work demands, and workplace interventions, and this finding might contribute to more in-depth understanding of sick leave prevention and RTW at the workplace.

One of the present investigations identified a wide spectrum of *leadership qualities* that were valued by employees on sick leave and their supervisors, and the qualities considered to be valuable differed between those two groups of actors.

Another study showed that eight public sector employees on long-term sick leave due to musculoskeletal problems experienced that *demands at work* were mostly cognitive and emotional in nature, and they felt that they themselves were the ones who made the demands.

A third study demonstrated that actors in twelve municipalities mainly described *workplace interventions* that targeted organizational systems, processes, and culture aimed at reducing sick leave rates. There was large variation in the interventions that were implemented. Workplace interventions targeted single or groups of employees were more seldom described. The current review showed that there is still only limited knowledge about the effectiveness of workplace interventions. Overall, this investigation found low quality evidence that neither supported nor refuted any beneficial effects of specific workplace interventions with regard to pain relief. In addition, there was moderate quality evidence that a multiple-component intervention reduced sickness absence in the intermediate term, but this was not sustained over time.

It was a challenge to try to use evidence from randomized controlled trials in the RTW process, and the results call for new EBP approaches to translate evidence into decisions concerning complex workplace interventions. In general, it seemed that the EBP steps and the PICO framework constructed a confined decision process. Furthermore, the evidence apparently differed depending on whether the interventions were aimed at prevention, cure, or rehabilitation. Moreover, it seemed that some evidence originated from “good-for-all” interventions, and some arose from “tailored-type” interventions. These observations show that there is a need to differentiate the roles of evidence from different sources, considering whether it inspires, challenges, enlightens, informs, or determines the intervention decision.

7 IMPLICATIONS FOR PRACTICE AND RESEARCH

The results of these five studies have implications for both further research and innovation, as well as for practice and education.

It is likely that having more in-depth knowledge about organizational workplace interventions can be important for workplace actors, social insurance personnel, general practitioners, occupational physicians, and other occupational health care professionals. Further research should be more distinct as to whether the objective of the interventions is to reduce symptoms, to prevent sick leave, or to promote RTW. It is also essential to distinguish between organizational and employee workplace interventions, and it might be advisable to find a balance between those two types of interventions in practice, since they seem to interfere with each other. We should also conduct more studies in which clinical and workplace RTW interventions are combined.

To be able to capture the phenomena of leadership qualities, work demands, and workplace interventions in deductive research, it is necessary to use dimensions and variables that cover relevant aspects. Such aspects might be revealed empirically by inductive research, as described in this thesis. Perhaps the 78 new variables of leadership qualities, the 53 variables of work demands, and the 306 workplace intervention descriptions presented here can be used to define items included in new instruments. The current results provide a good starting point for improving the insight into the correlation between workplace aspects and sick leave duration. Our findings might also be used to develop new feedback approaches between supervisors and subordinates in order to raise awareness regarding both needs and solutions. Flexible approaches will probably be needed to tailor approaches so that they are consistent with the high variability of individual needs and contextual conditions.

These explorative studies revealed renewed possibilities for translation and implementation of science into practice. The oldest and most frequently used translational method is to perform randomized controlled trials, systematize them into reviews, and implement them in practice. This is a useful way of putting science into practice. Still, the three explorative investigations in this thesis (studies I, II, and IV) provide other possibilities for that purpose. The results might enable exploration of new variables, or even application of renewed terminology to examine known variables, such as employer-provided workplace interventions or the impact of leadership on sick leave. Another example is a new possibility of studying combinations of workplace aspects and their effects on sick leave by targeting structures, cultures, processes, and persons at the workplace. New knowledge might also contribute to a change in practice, for instance regarding what workplace interventions are actually provided. The current results may also prove useful as a basis for developing novel evidence-based methods to achieve support and follow-up of employees on sick leave, such as a web portal presenting evidence from science, supervisor-employee feedback evaluations, checklists for interventions, and other sources. The findings also indicate the importance of broadening the perspective of workers who are absent due to musculoskeletal disorders. Therefore, occupational rehabilitation should include all categories of demands existing within specific occupations.

Disability management [25, 26, 28, 280] has been described and developed as an international field of research and practice, and it is an employer-based strategy aimed at successful job maintenance or optimum timing for RTW among persons with disabilities. The focus in this field has been on the competence needed when an employee's injuries prevent him/her from working. Several countries have joined the international efforts concerning certification of disability management professionals and RTW coordinators [149, 165, 281]. These professionals are not intended to replace supervisors, but rather to support supervisors and their subordinates, for example, when identifying work demands and choosing workplace interventions in the RTW process in the workplace. As more professional advisors become involved in the RTW actions, it is possible that some of the leadership qualities reported here will be possessed by people other than immediate supervisors, or that they will make the RTW coordinators of educational programmes aware of the needs of people on sick leave.

Until now, there has been a lack of rigorous experimental research assessing the effectiveness of organizational workplace interventions, and such efforts might be easier by the insight into the complexity of these types of interventions that is provided here. It is also clear that there is an urgent need for high quality RCTs studying well-designed workplace interventions. According to the results of the present Cochrane systematic review, further research is very likely to have a pronounced impact on our confidence in the estimate of effects, and it will probably also change the estimate.

To be able to ensure better implementation of intervention programme in the future, it is also crucial that implementation science more often be linked to implementation practice. According to the PARiHS framework [206, 207, 282], it seems that the national sick leave reduction programme initiated in Norway (study IV) lost one of the *three components* (evidence, context, and facilitation) that is essential for successful implementation. In short, the *evidence* documenting what workplace interventions should be implemented by the municipalities was not clearly presented in this programme. Also the new model of EBP steps suggested in study IV might be of value in this context. The national programme also lacked the presence of a researcher as a collaborator and implementation *facilitator*. Implementing workplace interventions in an evidence-based strategy that requires continuous dialogue and collaboration with researchers during the entire process. The researcher's role is to provide relevant evidence, to discuss the knowledge base for choosing interventions, and to help design and evaluate implementation of evidence-based workplace interventions. By using of audit and feedback, social interactions and dialog has been showed to be effective to increase the evidence uptake in practice. Evaluations of complex interventions should also include more detailed planning and reporting of the implementation per se in new *contexts*, and consider how to measure the quality of implementation process [272].

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Leadership Qualities in the Return to Work Process: A Content Analysis

Randi W. Aas · Kjersti L. Ellingsen ·
Preben Lindøe · Anders Möller

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Abstract *Introduction* Supervisors have a core role to play in facilitating the safe and effective return to work (RTW) of employees on long-term sick leave. Previous studies have revealed that the risk of long-term sick leave increases with lower social support from the supervisor and lower management quality. The aim of this study was to elucidate leadership qualities that are valued in the RTW process of employees. *Methods* The study formed part of the Rogaland RTW study, and was designed as a qualitative case study that included interviews with subordinates ($n = 30$) on long-term sick leave (>8 weeks) and their supervisors ($n = 28$) from 19 companies. The informants represented a heterogeneous sample regarding diagnoses, types of occupations, positions, company sector, branches, and sizes. Qualitative and quantitative content analysis of the transcripts obtained during interviews identified leadership qualities. *Results* Three-hundred-and-forty-five descriptions of leadership qualities were identified, which were categorized into 78 distinct leadership qualities and 7

leadership types. The five most valued leadership qualities were “ability to make contact”, “being considerate”, “being understanding”, “being empathic”, and “being appreciative”. The three most valued leadership types were the Protector, Problem-Solver, and Contact-Maker. While the subordinates gave more descriptions to the Encourager, Recognizer, and Protector types, the supervisors described the Responsibility-Maker and Problem-Solver most often. The most frequent reported combination of types was the Protector and Problem-Solver, reported by 54% of the informants, while the most common three-types-combination was the Protector, Problem-Solver, and Contact-Maker reported by 37% of the informants. *Conclusions* This study revealed that there is a wide spectrum of valued leadership qualities, with those reported as being valuable differing between employees and supervisors.

Keywords Sick leave · Disability management · Return to work · Content analysis · Occupational rehabilitation · Workplace · Leadership · Rogaland RTW study

R. W. Aas (✉)
IRIS, International Research Institute of Stavanger,
Box 8046, 4068 Stavanger, Norway
e-mail: randi.aas@iris.no

R. W. Aas
Karolinska Institutet, Stockholm, Sweden

K. L. Ellingsen
Diakonhjemmet University College Rogaland, Sandnes, Norway

P. Lindøe
Faculty of Social Sciences, University of Stavanger,
Stavanger, Norway

A. Möller
Nordic School of Public Health, Gothenburg, Sweden

Introduction

Leadership research has a long history. Research during the first half of the 20th century concentrated on mapping the personal traits of supervisors [1], and a research program on leadership at Ohio State University after World War II contributed to a new focus on the behavior of supervisors [2]. Several studies have quantified leadership styles and behaviors. The most well known are the theories of transformational and transactional leadership [3, 4], and task-versus relation/people-oriented leadership. Both schools were criticized by a third direction—the situational and

contingency theories of leadership—for not including situational dependency [5]. Situational theories focused on the interaction between the supervisor and the subordinate. This research indicated that supervisors who are able to adjust to different situations are more effective.

A literature review in 2005 focused on the relationship between leadership and the health of subordinates [6], and concluded that even though leadership is a well explored topic in the scientific literature, only a few studies have investigated the impact of leadership on subordinates, and even a smaller number have investigated how leadership affects the health of subordinates. The authors of that review suggested that leadership is best studied indirectly through other variables, since supervisors have a large impact on factors such as the demands, control, and social support of subordinates, and these strongly influence employee health. The review of 52 studies by Woods [7] produced good evidence of an association between poor social support and an increased risk of musculoskeletal morbidity, but also limited evidence of associations of poor social support with musculoskeletal-disease-related sick leave and not returning to work after suffering from musculoskeletal disease.

Management and leadership styles can greatly influence injuries, disability, and sick leave. Labriola et al. [8] found that the risk of long-term sick leave (>8 weeks) increased with lower support from the supervisor and lower management quality among 1610 employees from 52 Danish workplaces. Vaananen et al. [9] found that a lack of supervisor support to women and lack of coworker support to men increased the frequency of sick leave (>21 days) among 3895 Finnish employees in the private industrial sector. A study on the Norwegian oil industry revealed that the style of and trust in a manager were important factors for predicting personal injuries, and confidence in management was significantly negatively correlated with sick leave [10]. Halford & Cohen [11] revealed a significant association between managerial support and musculoskeletal symptoms in a self-reported interview-based survey among call-center workers.

A situation that often challenges leadership qualities is an employee being on long-term sick leave. During the 1990s the responsibility for employees on sick leave in Norway gradually transferred from the health and social security authorities to the labor market and employers, which increased the attention paid to the leadership of employees on sick leave, disability pensions, and early retirement. The Sandman report [12] in 2000 and the subsequent *Three Partite Agreement for an Inclusive Working Life* between the government, employers, and employee organizations published in 2001 [13] defined the workplace as the main arena for follow-up activities and interventions. The immediate supervisor and the subordinate became the

“core actors”, whilst the physician, health personnel, and others were considered “good helpers”. Thus, supervisors in Norway now provide “a sick-leave and RTW service”. Accordingly, in a Swedish study with focus groups among 23 supervisors aiming to explore views on employers responsibility in the return to work process, the supervisors defined themselves as the key persons, carrying the main responsibility for the rehabilitation of the sick-listed employees [14]. This responsibility places special demands on supervisors, especially on their leadership qualities. This new leadership role has not been thoroughly described and defined, and many supervisors feel confused and unskilled in this important task.

Additionally, it is still unclear what type of leadership is most valued for subordinates on long-term sick leave. Providing valued supervision might facilitate a safe, sustainable, and fast RTW after disease, illness, or injury. The aim of this study was therefore to explore which leadership qualities and types are valued by subordinates and their supervisors when subordinates are on long-term sick leave and in the process of returning to work. In this project the *leadership qualities* of supervisors were defined as the knowledge, competence, abilities, skills, and attitudes that they exhibited, and *leadership types* were defined as a set of similar leadership qualities.

Method

Design

This study had a qualitative design with semi structured interviews conducted using open-ended questions. The materials were selected from the larger Rogaland RTW case study—other results from this study are either in process or being presented elsewhere. An inductive content analysis strategy was developed in this project, also named conventional content analysis [15]. The inductive strategy was chosen due to the limited amount of theories, and terminology on leadership related to RTW. Both qualitative and quantitative content analyses were chosen. The interviews and analysis focused on the manifest meaning of the informants’ point of view, rather than on the latent content. Content analysis was regarded as appropriate as the results will be used to build an instrument on the identified categories.

Informants

The informants consisted of a heterogeneous sample of employees ($n = 30$) on long-term sick leave (>8 weeks) with different diseases and disorders, and their immediate supervisors ($n = 28$). Their experiences should be highly

relevant to elucidating the crucial follow-up role that supervisors play in today's workplace environment. Additionally, supervisors themselves are expected to possess important experience-based knowledge that might contrast or fill in the perspectives of the subordinates. Several of the employees had comorbidities. The informants were recruited through their companies ($n = 19$). The sampled companies were selected to ensure diversity regarding size, public versus private sectors, and high versus low rates of sick leave. The education, health care, finance, and petroleum industry sectors were represented. Such a heterogeneous sample was established so as to obtain a more comprehensive understanding at both the individual and organizational levels.

The included employees were selected with the aid of the company personnel systems which obtained information on the following selection criteria at the recruitment date: (1) on sick leave for 8 weeks or more during the previous 6 months due to own health situation (i.e., not due to sickness or illness of their families), (2) on full sickness benefit, active sickness benefit, partial/graded sickness benefit, or rehabilitation benefit, and (3) being employed at least 50% of full-time in the company (including overtime/extra work) during the previous 8 weeks.

Potential informants were invited to participate in the study by sending out a postal invitation that contained letters from both the researchers and their employing company. This included an assurance that the researchers did not know the identities of the persons on sick leave. They were given written information about the study and asked to fill out and return a written informed consent if they accepted to participate in the study. This procedure meant that the researchers did not know who did not answer. When an employee agreed to participate, their supervisor also participated in accordance with agreements between the company and the study. The supervisors were identified as those who had following the subordinates closest during the period of sick leave. One of the subordinates did not want us to interview her/his supervisor, and another supervisor failed to be interviewed due to appointment problems.

Data Collection

The employees and supervisors were interviewed face to face once in all but one case, which was performed by telephone. Two researchers performed the interviews with the subordinates (RWA, $n = 27$; NN1, $n = 3$), and four researchers performed the interviews with the supervisors (PL, $n = 3$; NN1, $n = 6$; NN2, $n = 3$; NN3, $n = 16$). The interviews took place at the research institution, workplace, or home in accordance with the request of each informant, with most occurring in the workplace. The interviews were conducted in privacy, and lasted approximately one hour.

Among a spectrum of topics in the interview guide, all the informants (employees and supervisors) were asked one open-ended question: "*Which leadership qualities do you consider to be the most important when following up employees on long-term sick leave?*" All of the interviews were audiotaped.

Analysis

A combination of qualitative and quantitative content analysis was applied [15–20]. The transcripts of 59 interviews were first transferred to a secure computer network and made anonymous. All sound tracks on transportable voice recorders were deleted immediately. The recordings were then transcribed verbatim into written language. Since the interviews were performed in Norwegian, we used two independent researchers to translate the main results into English, with disagreements resolved by discussion and consensus.

Three category levels were identified in the material. The third-level coding involved condensing the meaning in the interviews line by line to reveal descriptions of leadership qualities. This phase was performed by a single researcher (RWA). The second-level coding, which identified leadership qualities, was performed independently by two researchers (RWA and KLE), with disagreements resolved by discussion and consensus. The phrasings from the informants were used as much as possible when naming the leadership qualities. The first-level coding described leadership types on the basis of leadership qualities. A single researcher (RWA) formulated the descriptions and categorized different leadership qualities according to similarity into leadership types. Then a second researcher (KLE) received the leadership qualities, and sorted also them into these leadership types. Only a few differences had to be resolved by discussion and consensus. All the co-authors (RWA, KLE, PL, and AM) suggested short names for the seven leadership types (e.g., Protector). Table 1 gives an example of this analysis process.

Finally the descriptions of leadership qualities were condensed by a single researcher (RWA) without the loss of any significant information. Many informants had the same or very similar descriptions, and these were combined together.

Descriptive statistical analyses using the Statistical Package for the Social Sciences (SPSS, version 15.0) in combination with Microsoft Excel were applied to reveal the reporting profiles and patterns of single informants and couples of informants (subordinate and immediate supervisor), and to the differences in reporting between the two informant groups, age-groups, gender, sector and branches. To compare means of agreements between groups Independent-Sample T-Tests were executed.

Table 1 Analysis process

Analyze method	Transcriptions from interviews	Third-level coding (leadership quality descriptions)	Second-level coding (leadership qualities)	First level coding (leadership types)
Example	Scientist: Which leadership qualities do you experience as important for a supervisor to possess, when following up subordinates on long term sick leave? Immediate leader: No, which leadership qualities should we possess? Understanding the person, what he or she feels like, listen and ask questions. Understanding the employee, what he or she feels like	Understanding the employee, what he or she feels like Listen Asking questions	Understanding Listening Inquiring	The considerate, empathic and protective leadership type (the protector) The contact-making and co-operative leadership type (the contact-maker) The contact-making and co-operative leadership type (the contact-maker)

Note: Example of the analysis process on three levels, where leadership-quality-descriptions emerged from the transcriptions by condensing the content, the leadership-qualities emerged from the descriptions, and the leadership-types emerged from the leadership qualities

Ethical Considerations

The quality of the experimental procedures and manuscript preparation was ensured using the Uniform Requirements for Manuscripts Submitted to Biomedical Journals [21]. A description of the study's ethical challenges was submitted to and clarified by the Norwegian Regional Committee for Ethics in Medical Research Region in 2004 and the Norwegian Social Science Data Services in 2005. Client confidentiality was ensured by giving each informant a fictitious name and an anonymous identification number. The names and numbers were kept separate, thus ensuring the confidentiality of sensitive personal information. A written informed consent was collected from all informants, who gave permission for the interviews to be tape-recorded under the assurance that they could at any time ask for recording to stop. They also had the opportunity to leave the study at any time without explanation. To ensure that no information was communicated between the supervisors and subordinates in each company, different researchers interviewed the two informant groups, and the researchers were not given access to the interviews before finishing their contact with the informants. Also, the informants' employers were not given information about who participated in the study, and the information about how many informants came from each company was also kept secret to prevent them from being identified.

Results

The results data comprised 345 descriptions of desired leadership qualities during following up subordinates on long-term sick leave. These comprised 78 distinct leadership qualities, and they were further categorized according to similarity into 7 types of leaderships. The mean number of

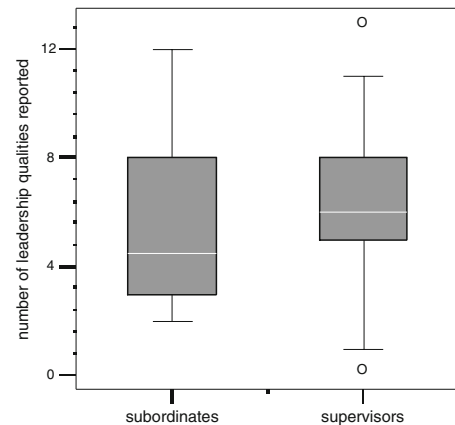


Fig. 1 Comparison of reporting profiles between the two informant groups shows that the median was higher for the supervisors than for the subordinates. The circles show outliers, the horizontal line the 95% confidence interval and the box shows the 50% interval

descriptions of leadership qualities was 5.85 (SD = 3.04, range = 0–13); 5.50 (SD = 2.98, range = 2–12) for subordinates; and 6.21 (SD = 3.1, range = 0–13) for supervisors. As shown in Fig. 1, in both groups the median was lower than the mean. Half of the supervisors gave between 5.0 and 7.5 descriptions.

Table 2 lists the results of the 78 leadership qualities. This table reveals that 53% of the leadership qualities were mentioned only once ($n = 25$) or twice ($n = 16$). Only 10 leadership qualities out of 78 were mentioned more than 10 times. This indicates that there was high variability in the informant reporting. The request to meet the needs individually was formulated by a supervisor by this quote: "I do not

Table 2 Leadership qualities reporting profile ($n = 78$)

Leadership qualities	Qualities	Descriptions	
	<i>n</i>	<i>n</i>	%
Ability to make contacts	1	19	5.5
Considerate	1	18	5.2
Understanding, empathic	2	15	4.3
Appreciative, ability to judge	2	14	4.1
Ability to communicate	1	13	3.8
Inclusive, listener	2	12	3.5
Problem solving abilities	1	10	2.9
Protective, competent, solution-oriented, deal with cross pressure	4	9	2.6
Accepting, responsible	2	8	2.3
Discreet, respectful, excite confidence	3	7	2.0
Resource-oriented, confidence	2	6	1.7
Flexible, human, enquiring-interested, open	4	5	1.4
Unprejudiced, action-oriented, judge of character, planning ability, honest	5	4	1.2
Empowering, close, encouraging, supportive, security-making, plain, fearless	7	3	0.9
Pleased, ability to differentiate, forthcoming, informative, create new contacts, creative, sympathize with, motivating, sincere, positive, ability to prioritize, professional, upright, fair, self-aware, challenging	16	2	0.6
Affirmative, protective, determined, conscious, direct, predictable, limit-setting, helpful, humorous, inspiring confronting, constructive, purposeful, observant, offensive, attentive, ability to organize, overview, generous, realistic, ability to interact, available, patient, warm, friendly	25	1	0.3
Total	78	345	100

Notes: Information on how many times each leadership quality was mentioned in the responses. For example, the 25 leadership qualities in the penultimate row of the table were mentioned once each, which for each is 0.3% of all responses (100%, $n = 345$)

have a fixed recipe about how to do this, since it differs greatly according to who the single employee is. This is the crucial part, does he have this...., then it will do."

One leadership quality that was mentioned often, especially by the supervisors, was the ability to handle conflicting interests, such as "business and the company" versus "the person on sick leave", "demands of productivity" versus "adaptation", "quick return" versus "empathy", and "the others" versus "the one on sick leave".

Table 3 describes the ten most-often-mentioned leadership qualities including descriptions of leadership quality. Many of the 345 descriptions of leadership quality that emerged from data fully or partly overlapped, with some differing only slightly. Some leadership qualities had rich and differentiated descriptions, whereas other descriptions were sparse. The descriptions in Table 3 are separated between the two informant groups, but we were unable to determine whether their content differed significantly. The subordinates and supervisors appeared to agree on many of the descriptions. For example one supervisor claimed that "It is important to show interest in their story and what they think, and I believe they possess answers for their challenges themselves, and what they are capable of mastering. To be open and receptive towards them..." One subordinate stated

that "It is really the management of a reduced resource that needs to be focused on, and how the company might best make use of it. This is not difficult, but often the easiest problem is the hardest one".

Table 4 provides an overview of all of the 78 leadership qualities sorted into the 7 leadership types, each of which contained 6–15 leadership qualities.

Table 5 gives two types of results, -how often each leadership quality description ($n = 345$) has been mentioned, and the rightmost part of the table shows how many informants that give at least one quality description of each of the seven types. Firstly, Table 5 gives the distribution of the 345 descriptions of leadership quality into the 7 leadership types, and indicates that there was an approximately equal distribution between the two most often reported types, the considerate, empathic, and protective leadership type (*Protector*, $n = 87$) and the competent and problem-solving leadership type (*Problem-Solver*, $n = 80$). The third most often mentioned leadership type was the contact making and interactive leadership type (*Contact-Maker*, $n = 62$). Table 5 lists the differences between the descriptions of the subordinates and their supervisors. While the subordinates gave more descriptions to the *Encourager*, *Recognizer* and *Protector* types, the supervisors described the *Responsibility-*

Table 3 Ten most-often-mentioned leadership qualities and their descriptions

#	Leadership qualities	Leadership quality descriptions; Subordinates (<i>n</i> = 30)	Leadership quality descriptions; Supervisors (<i>n</i> = 28)
1	Contact ability (<i>n</i> = 19)	The supervisor needs to take the initiative to maintain as much regular contact as possible, by arranging meetings, making phone calls, and maybe visiting. Talking to the employee will result in a faster RTW (<i>n</i> = 11).	Good in taking initiative and sustaining regular and close contact. Follow up with conversations (<i>n</i> = 8).
2	Considerate (<i>n</i> = 18)	The supervisor should think and care about how the employee feels, give care in a noticeable way, give feedback and ask “how are you, and when will you be back”, and do his/her very best for the person on sick leave (<i>n</i> = 13).	Show thoughtfulness toward the individual worker, by sending flowers, making phone calls, and taking a cup of coffee. Concern oneself. Ask “How are you?” (<i>n</i> = 5).
3	Understanding (<i>n</i> = 15)	It is important to understand the reason for the sickness absence, and the underlying situation. It is more than a superficial problem. Reduce the feeling of bad conscience. It is important to be understood (<i>n</i> = 8).	Show understanding for the situation and person, what the worker on sickness absence feels, how she or he is, and what kind of limitations she/he experiences. Appreciate the individual situation and person (<i>n</i> = 7).
4	Empathic (<i>n</i> = 15)	Meet on the stage that the person is on and in the situation that they are in (<i>n</i> = 3).	The ability to acquaint oneself with and have empathy for other situations, and the story of the person on sick leave. You need to show empathy (<i>n</i> = 12).
5	Appreciative (<i>n</i> = 14)	Give a feeling of dignity, and not a signal that the employee is a social outcast. Do not patronize. Give credit for a difficult job. Respect the sickness absence, and do not push the person to return to work. Be careful with strong opinions of when it is relevant to get back to work, but support expressed wishes about a return to work. Meet the employee as she/he is, and indicate that it is actually him/her that is wanted back. Give security, recognition, and praise (<i>n</i> = 10).	People are actually very flexible even when they are on sick leave, and they tend to go to work more than necessary. They work against bad conscience. Do not pretend to completely understand the other person, because this is impossible (<i>n</i> = 4).
6	Ability to judge (<i>n</i> = 14)	The demands differ according to whether the employee is at home or at work. Clarify and create a common understanding for the present status. Determine if the causes are job-related. Handle people when taking into account their differences, and be aware of individual needs (<i>n</i> = 4).	Assess the causes of the absence: work-related or not? Describe the situation the way that it is, and what is the best for you regarding the size of your position, and health condition. Understand and differentiate among cases, and see time perspectives and causes. Differentiate approaches according to the reasons underlying the sick leave. Differentiate between cases where accommodating is and is not relevant. Differentiate between different individuals and situations. Identify different needs depending on phases, time, causes, situations, persons, wishes, and types of sick leave. Treat the person as an individual. Clarify the situation at any time. Listen to the opinion of the individual (<i>n</i> = 10).
7	Ability to communicate (<i>n</i> = 13)	It is important to talk about the problem. Ask the right questions. Facilitate good dialog by being approachable (<i>n</i> = 4).	Facilitate close contact by communicating in a good way. Conversations are a challenge and require balance. Establish a good relationship, and perform face-to-face communication whenever possible. Tackle comments such as “I am feeling so bad”. Differentiate the content of the contact. Be an easy conversation partner who is easy to talk with (<i>n</i> = 9).
8	Listener (<i>n</i> = 12)	Listen to the employee to find solutions, but also how she/he feels (<i>n</i> = 6).	Good ability to sit down, listen, and be receptive to answers (<i>n</i> = 6).

Table 3 continued

#	Leadership qualities	Leadership quality descriptions; Subordinates (n = 30)	Leadership quality descriptions; Supervisors (n = 28)
9	Inclusive (n = 12)	Create a feeling of being included in the dialog. Show that the person is welcomed, and wanted back. Prevent distancing between the employee and the workplace, which will facilitate inclusion upon return. Create interdependence with the workplace (n = 8).	Invite the person on sickness absence to social activities, showing that he/she still has a place. Create a desire for them to come back. Be inclusive, welcome them in a good way, and create a good feeling of belonging (n = 4).
10	Problem solving abilities (n = 10)	Find suitable and flexible working tasks (n = 2).	Prepare for the return to work by arranging the conditions. Help in adapting to the needs of the individual. It is important that the supervisor has knowledge and can adapt to the needs of the individual person. Be able to find alternative solutions. The possibilities are limited, and jobs are similar (n = 8).

Note: n, number of informants who described the leadership quality in the interviews

Maker and *Problem-Solver* most often. The table also reports differences between the two age-groups, <45 years and 45 years+. While the youngest subordinates want to be recognized (*Recognizer*) and encouraged (*Encourager*), the oldest describes more often supervisors that solve problems (*Problem-Solver*) and challenge the employee (*Responsible-Maker*). Secondly, the results on informants (n = 57) shows a more equal reporting profile between the informant groups, with the exception of the *Responsible-Maker* and *Problem-Solver*, which more supervisors than subordinates mentioned.

Even though the single leadership quality is of interest, the particular combination of leadership qualities is what forms a comprehensive leader. Table 6 gives information on frequent combinations reported in this material. These results are also presented in the appendix, where the reporting profiles of combinations are possible to read in relation to the single subordinate and his/her supervisor. Two of the combinations in Table 6 (1, 2) are of similar leadership types, while the others are combinations of complementary leadership types (3,4,5). The most common two-types-combination is the *Protector* and *Problem-Solver* (n = 31), reported by 54% of the informants, while the most common three-types-combination is the *Protector*, *Problem-Solver* & *Contact-Maker* (n = 21) reported by 37% of the informants. One combination frequently reported by the supervisors (72%), but not by the subordinates (28%) is the two most solution-oriented types, *Problem-Solver* & *Responsible-Maker*. Informants from finance seem also to highly value this combination. Opposite, the most emotional-oriented types *Protector* & *Recognizer* are most valued by the subordinates (65%), and especially the informants from health care.

Table 7 reports results of the couples (subordinate and immediate supervisor) agreement in reporting. If the reporting would be distributed by random, the agreement would be approximately 50%, as the mean reporting of leadership type was 3.46 for each informant (1–6, min-max), with a lower

average of 3.3 for the subordinates (CI 2.8–3.7) than the supervisors 3.7 (CI 3.3–4.1). However, of all 27 couples there were a mean agreement of 66.3% between the subordinate and the supervisor. Subordinates did more often have the same leadership types as their leaders than the opposite way (70.2% versus 62.3%). There was no significant difference in agreement between different age-groups, gender and sector, but between branches. Those from health care were significant more often agreed (74.6% agreement), than those from finance (53.2% agreement, $P = 0.004$) and education (57.5% agreement, $P = 0.019$). Those couples who were the same gender had a higher agreement than those that had different sexes, but this was not significant (68.1% vs. 59.8%).

Discussion

This study has some limitations. Together with the main qualitative results, this study also revealed the frequencies at which certain leadership qualities were present. However, it is not possible to generalize from these results in a statistical manner since the informants did not form a representative sample. Although large-scale representative studies are needed, theoretical generalization is possible. Another limitation for generalisations of the results is to what extent these results from Norway are relevant in other jurisdictions. The relationship between subordinates on sick leave and their supervisors is a universal topic concerning human relations, even though it might be highly influenced by working life structures and culture. In Norway the culture in companies could be claimed to be informal compared to other western societies, and the Nordic model of the tripartite co-operation between the unions, employers and government might influence on the relationship between subordinates and supervisors. Still, most of these results are considered to be relevant for other western societies.

Table 4 Leadership types ($n = 7$) and their qualities ($n = 78$)

#	Leadership types	<i>N</i>	Leadership qualities	
1	Caring, empathic and protective (protector)	14	1 Safeguarder 2 Understanding 3 Helpful 4 Inclusive 5 Empathic 6 Protective 7 Sympathize with	8 Human 9 Close 10 Considerate 11 Attentive 12 Supportive 13 Warm 14 Friendly
2	Trust-creating (trust creator)	7	15 Discreet 16 Predictable 17 Forthcoming 18 Upright	19 Excite confidence 20 Security-making 21 Open
3	Recognizing (recognizer)	6	22 Accepting 23 Appreciative 24 Affirmative	25 Unprejudiced 26 Respectful 27 Confidence
4	Competent and problem solving (problem-solver)	17	28 Responsible 29 Ability to differentiate 30 Flexible 31 Action-oriented 32 Constructive 33 Creative 34 Competent 35 Solution-oriented 36 Observant	37 Ability to organize 38 Overview 39 Planning ability 40 Ability to prioritize 41 Problem-solving abilities 42 Professionally 43 Resource-oriented 44 Ability to judge
5	Contact-making and interactive (contact-maker)	9	45 Informative 46 Enquiring-interested 47 Ability to communicate 48 Contact ability 49 Create new contacts	50 Listener 51 Judge of character 52 Ability to interact 53 Self-aware
6	Positive, pleased, generous and patient (encourager)	10	54 Motivating 55 Inspiring 56 Generous 57 Positive 58 Pleased	59 Available 60 Humoristic 61 Fair 62 Patient 63 Encouraging
7	Offensive, fearless, challenging and direct (responsibility-maker)	15	64 Conscious 65 Fearless 66 Honest 67 Direct 68 Determined 69 Limit-setting 70 Confronting 71 Empowering	72 Purposeful 73 Offensive 74 Sincere 75 Realistic 76 Challenging 77 Plain 78 Deal with cross-pressure

Note: *N* refer to the number of leadership qualities within the single leadership type

The seven leadership types were constructed qualitatively by face similarity. Factor analysis needs to be performed in a larger quantitative study to clarify whether these are really seven different types. Another limitation of this study is the lack of knowledge of nonresponders. To ensure anonymity, the Committee for Ethics in Medical

Research did not allow us to ask for the reasons why potential subjects decided not to participate in the study. We were additionally not allowed to obtain information about all the employees who were invited to participate. Therefore, we were not able to give descriptions of those who did not want to participate in the study.

Table 5 Seven leadership types and the frequency of descriptions reported

Leadership Type	Leadership quality descriptions*										Informants**					
	Subordinates					Supervisors					Subordinates			Supervisors		
	n	%	n	%	Total	n	%	n	%	Age < 45***	n	%	n	%	n	%
Protector	49	56	38	44	87	100	27	55	22	45	25	83	22	81	47	82
Trust-Creator	12	46	14	54	26	100	6	50	6	50	10	33	11	41	21	37
Recognizer	27	68	13	33	40	100	16	59	11	41	14	47	9	33	23	40
Problem-Solver	27	34	53	66	80	100	9	33	18	67	16	53	20	74	36	63
Contact-Maker	29	47	33	53	62	100	15	52	14	48	21	70	19	70	40	70
Encourager	12	75	4	25	16	100	9	75	3	25	6	20	4	15	10	18
Responsibility-Maker	9	26	25	74	34	100	3	33	6	67	6	20	15	56	21	37
Total	165		180		345		85	52	80	48	30		27		57	

Notes: * $n = 345$, number of leadership qualities descriptions reported. ** $n = 57$, number of informants reporting each leadership type. *** $n = 165$, the subordinates reporting of leadership quality descriptions are divided into two age-groups: $n = 14 < 45$ and $n = 16, 45$ years+

Table 6 Reported combinations of leadership types

Combinations	N	Information group*				Age group**				Sector*				Branch*							
		Subordinate		Supervisor		>45 years		45 years+		Private		Public		Education		Health Care		Finance		Others	
		n (M)	%	n (M)	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1. Protector & Recognizer	20	13 (3)	65	7 (2)	35	7	54	6	46	4	20	16	80	4	20	11	55	2	10	3	15
2. Problem-solver & Responsible-Maker	18	5 (1)	28	13 (2)	72	2	40	3	60	5	28	13	72	4	22	9	50	5	28	0	0
3. Protector & Problemsolver	31	14 (2)	45	17 (4)	55	6	43	8	57	6	19	25	81	8	26	17	55	5	16	1	3
4. Problem-Solver & Contact-Maker	26	12 (1)	46	14 (1)	54	5	42	7	58	5	19	21	81	7	27	14	54	4	15	1	4
5. Protector & Problem-Solver & Contact-Maker	21	10 (1)	48	11 (1)	52	4	40	6	60	4	19	17	81	5	24	12	57	3	14	1	5
Total	57	30 (7)	53	27 (7)	47	14	47	16	53	15	26	42	74	14	25	25	44	10	18	8	14

Notes: Combination 1 and 2 are of more equal types, while 3, 4, 5 and 6 are complementary types. * $n = 57$ informants. ** $n = 30$ informants. M = Male gender. Education also includes kindergartens

Table 7 Agreement in reporting between couples of subordinates and their supervisor

Leadership type	Agree*	Disagree*	
	Couples (%)	Couples (%)	Subordinates**
Protector	21 (78)	3 (11)	2
Trust-Creator	5 (19)	9 (33)	3
Recognizer	5 (19)	12 (44)	8
Problem-Solver	1 (41)	12 (44)	3
Contact-Maker	14 (52)	10 (37)	5
Encourager	1 (4)	8 (30)	5
Responsible-Maker	3 (11)	14 (52)	2

Notes: $N = 27$, as three couples were excluded due to not have any results from the supervisors. * There were three possible combinations of (dis)agreements; the subordinate and his/her supervisor agreed that the leadership type was important, they agreed that it was not important, or they disagreed. This table give information on the first and third option. ** The informants that find the leadership type valuable

The aim of this study was to explore the valued leadership qualities in the situation where a subordinate is on long-term sick leave. The most important and novel aspects are the distinct 78 leadership qualities revealed, and especially their qualitative descriptions. Some more general findings might also be important. Firstly, the results show a high variability in the leadership qualities valued by the informants, which might be attributable to a high variability in personal preferences, working tasks, and contextual factors. Supported by this finding, we could claim that there is lack of consensus about leaders. This could indicate that each case needs to be addressed using a tailored approach, and hence that standardized leadership qualities would only meet the needs of a few. Thereby the supervisor needs a feedback system which enables him/her to possess knowledge about which leadership qualities that are needed in the single case. This finding is supported by the situational theories of leaderships, where effective leadership depends on the ability to adjust to the unique situation.

Secondly, the results suggest that a combination of two main leadership types is valued to help subordinates returning to work: Protector and Problem-Solver. It appears further as these are complemented by the Contact-Maker so as to ensure the success of the other two. Those on long-term sick leave are often in a vulnerable situation, where social support appears to be crucial. Thus, the ability to provide social support might be the most important characteristic of a supervisor. Several of the leadership qualities revealed in this study might be viewed as types of social support, which is consistent with the four types of social support reported by House [22]: emotional support, instrumental support, informational support, and appraisal. Social support was also added by Johnsen [23] to the often used Demand-Control model [24, 25], arguing that social support is a basic need in the workplace. In this model social support was divided into the support provided by supervisors and coworkers, where the first included the supervisor paying attention, helping getting work done, and creating good teamwork [25].

Shaw and colleagues [26] investigated the perspective of employees on the role of the supervisors in aiding workers after injuries, and showed that interpersonal aspects of supervision might be as important as accommodating physical work. This is consistent with our third finding that employees were focused more on the Recognizer, Encourager and Protector than the Problem-Solver. The need for a balance between tasks versus relation/person-oriented leadership has for the past 50 years been described in leadership theories using terms such as relationship behavior versus task behavior, employee-centered versus product-centered, and supportive versus work-facilitative [6]. The supervisors were opposite describing the Responsible-Maker and the Problem-Solver most often. An explanation for this finding could be the different role the subordinate versus the supervisor have. The responsibility both

for the overall delivery towards management, and the accommodations are held by the supervisor, while the subordinate needs to protect own health status towards the demands from the employer. Another finding in this study is that the same leadership types are more often described by those 45 years and older. Younger subordinates might need more recognition, encouragement and protection than the older workers, in a situation of sickness absence.

The high agreement in reporting between the single couples of subordinates and immediate supervisors is another interesting finding from this study. Those from health care agree in 75% of the reported leadership types. This might be due to transferring the paradigm of care, in which most of those informants are educated within to the support or care of sick listed employee. However, the articulated qualities are not necessary those that are practiced. This is a general risk for all groups when the results are reported rather than observed.

The results of this study have implications both for further research and development, and also for practice. Disability Management (DM) has been described and developed as a research and practice field internationally [27–30], and is an employer-based strategy aimed at successful job maintenance or optimum timing for RTW for persons with disabilities [30, 31]. The focus in this field has been on the competence needed when an employee's injuries prevents him/her from working. Several countries have joined the international effort on certifying disability management professionals and RTW coordinators [28, 29, 32, 33]. These professionals are not intended to replace the supervisors, but rather to support the supervisors and the subordinate in the RTW process in the workplace. As more professional advisors become involved in the RTW process, some of the leadership qualities reported here could be possessed by people other than the immediate supervisor.

Our results could also be used to supplement the content of leadership development programs. The 78 new variables with condensed descriptions could be used to define items included in new instruments. The study provides a good start point for improving the insight into the correlation between presence/absence of leadership qualities and sick leave duration. Our findings could also be used to develop new feedback approaches between the supervisor and the subordinate to raise the awareness of both needs and solutions. To tailor approaches consistent with the high variability of individual needs and contextual conditions, flexible approaches are needed.

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Appendix: The Reporting Profile

Age	Gender(*)	Protector(*)	Trust-Creator(*)	Recognizer(*)	Problem-Solver(*)	Contact-Maker(*)	Encourager(*)	Responsible-Maker(*)
40–50	F(F)	3(1)	1(1)	3		(1)		
40–50	F(F)	2(2)		1	2(2)	4	2	1(2)
30–40	F(F)	3(1)	(1)	4	(6)	(1)	1(1)	1(1)
50–60	F(F)	1(2)			1(1)	2(3)		(1)
30–40	F(F)	4(3)	1(1)	3(2)	2(4)			(1)
30–40	F(F)	3(1)	(1)	3(2)	1(1)			1(1)
30–40	F(M)	1(3)	1	(2)	(2)	1		
50–60	F(F)	(1)	1	(1)	(3)	1(2)	3	(1)
50–60	F(F)				1(7)	1(5)	(1)	
60–70	M(M)	1	(1)	1(1)		1(1)		
20–30	M(F)	1(2)		2	(2)	2(1)		(2)
30–40	F(F)	1(1)	2(1)	2(2)	1	1(1)	1	
50–60	F(F)	1(1)		2	2(2)	(2)		3
50–60	F(M)	2(2)			(2)	1(3)		(3)
30–40	F(F)	2			(4)	2(3)		(2)
50–60	F(F)	2(2)		1	(3)	1(1)	(1)	(2)
30–40	M(M)	2(1)	(1)		(2)		1	(1)
50–60	M(F)	1(2)		2	8(3)	(1)		1
60–70	F(M)	2(2)		1	1(2)	1		
40–50	F(F)			(1)	1(1)	1(1)		(3)
30–40	F(F)	2(4)	1(1)		1	1		(2)
50–60	F(F)	2(1)	1	(1)	2(4)	1(1)		
50–60	M(–)		1	1				
50–60	M(M)					2(1)		
30–40	M(M)	1			1	2		
60–70	F(F)	2(1)	(3)		1(1)	1(2)		(1)
40–50	F(M)	3	2		1	1		2
50–60	F(F)	2(1)			1	1(1)		(2)
30–40	F(M)	1(3)	(1)	1(1)		1	(1)	
30–40	F(F)	4(1)	1(2)		(1)	(2)	4	

Notes: The number in the table is referring to how many leadership qualities descriptions each informant reported. * The information in brackets is the supervisors reporting. Age is only referring to the subordinates. Gender: M = Male, F = Female, the supervisors gender is reported in brackets

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II

On long term sick leave due to musculoskeletal diseases and disorders. Experiences of work demands

Randi Wågø Aas^{a,b,c,*}, Cathrine Thingbø^a, Kari Anne Holte^a, Kristine Lie^a, Inger Anna Lode^a

^a PreSenter, International Research Institute of Stavanger (IRIS), Norway

^b Division of Insurance Medicine, Department of Clinical Neuroscience, Karolinska Institutet, Stockholm, Sweden

^c Faculty of Health Science, Oslo University College, Norway

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Abstract Background: The rate of sick leave is higher in the public sector than in the private sector in several countries, making it essential to thoroughly investigate employees in the public sector. The following research question was investigated: How do employees on long-term sick leave (>8 weeks) due to musculoskeletal disorders or diseases describe their work demands? Method: This paper is from the larger Rogaland RTW case study. The informants were female employees (n=8) in the first-line public sector with different types of musculoskeletal diseases or disorders. Qualitative interviews were conducted using a semi-structured interview guide based on two measures: Worker Role Interview and Work Environmental Impact Scale. Data was analysed by condensing and categorizing meaning. Results: Fifty-one work demands were described, only five of which were physical demands. Demands were sometimes described as merely negative or positive for the work performance, but also as both. Most of the negative demands were emotional and cognitive challenges in mastering the work tasks. Most of the demands (n=36) were experienced to be claimed by the employee herself, with only a few being claimed by the employer or environment (n=7) or by both (n=8). Conclusion: Eight employees in the public sector on long-term sick leave due to musculoskeletal problems experienced mostly cognitive and emotional demands, and defined themselves as the work-demand claimer. The results of this study point to the importance of broadening the perspective in work rehabilitation for workers absent due to diagnosis of the musculoskeletal system.

Keywords: Return to Work, Occupational rehabilitation, Model of Human Occupation, Worker Role Interview, Work Environmental Impact Scale

1. Background

Sickness absence and disability are considerable problems in the working population. Employees with diseases or disorders of the musculoskeletal system constitute the largest group with sickness absence and disability pension in many industrialized countries [16].

Human service organizations [17] contain occupational groups such as health care personnel, teachers and social workers who are at a high risk of long-term sickness absence [36]. This might be attributable to the high complexity of the work performed within such organizations, which have specific characteristics and demands [12].

Job demands have been defined in the literature as requirements set by the environment [33]. Job demands can be detrimental if they are not balanced against job resources [12]. The most widely used theoretical model linking work demands to health is the demand-control model [25, 26]. Demands are in this model, referring to psychological demands, a dimension that includes questions about how hard people work,

organisational constraints on task completion and conflicting demands. The model combines physiological demands with the level of control (ibid). Physical demands have also been included in the model (ibid). The model was first used for cardiovascular diseases [47], and later for musculoskeletal disorders [2, 5, 7-9, 22, 23, 37, 42]. Associations between job demands and sickness absence have also been found [34, 46]. However, how job demands might determine return to work (RTW) has been studied only to a limited extent [24].

The demand-control model has been criticized for not being adapted to human service work [12, 13, 32, 44]. Other perspectives might be relevant to understanding the demands and their complexity in the associated organizations. The Model of Human Occupation (MoHO), which was first described in 1985 [27], seeks to explain how occupation is motivated, patterned and performed [11]. MoHO may be well-suited also for studying the relation between job demands and occupational performance. MoHO is based on system theory and explains thinking, feeling and doing as arising out of the interaction between internal components and the environment. The environment is divided into physical and social

* Address for correspondence: Randi Wågø Aas, IRIS, Box 8046, 4068 Stavanger, Norway, Telephone: +47 51 87 51 57 or +47 91 18 22 66, Email: randi.aas@iris.no

environments which offer several opportunities, resources, demands and constraints. How the environment influences behaviour depends on a person's values, interests, personal causation, roles, habits and performance capacity. Interactions between humans and environments are affected by occupational participation, performance and skills. Occupational participation is defined as engagement in work, play or activities of daily living as part of one's sociocultural context; occupational performance refers to doing an occupational form, and occupational skills are the observable, goal-directed actions of a person [28].

The experiences and interpretations of work demands might differ between being on and not being on long-term sick leave. The expectations that individuals have of themselves, the expectations from the physical and social environments, and also the content of the work tasks make different demands on employees. The lack of knowledge about how employees on long-term sick leave in human service occupations experience different work demands in the RTW process indicates the need for further studies. This knowledge is crucial for all stakeholders, including the employer which has the responsibility of finding solutions at the workplace.

2. Aim

The aim of this study was to elucidate the work demands experienced by employees in human service organizations (e.g. the public sector) by answering the following question: How do employees on long-term sick leave describe their work demands in relation to their work situation? Implicitly this involved answering the following questions: (1) what tasks did they perform at work? (2) what work demands did they describe? (3) were the work demands mostly physical? (4) were the work demands described as exerting positive, negative or neutral effects on the work performance? and (5) were the experienced demand maker the employee, the employer or environment?

3. Methods

3.1 Study design

The study was designed as a qualitative study with semi-structured interviews. The informants comprised a subpopulation of employees from human service organizations (e.g. first-line public sector) from the Rogaland RTW case study, with 30 persons on long-term sick leave being followed for approximately 8 months each. Results from other parts of the study have been published elsewhere [1, 35].

3.2 Informants

Inclusion criteria at the recruitment date for taking part in the Rogaland RTW case study were having been on active, full or graded sick leave or disablement benefits for at least 8 weeks during the previous 6 months due to the person's own health situation, and having being employed on at least 50 % time during the previous 8 weeks. Additionally, the following three inclusion criteria all had to be met: (1) diseases or disorders of the musculoskeletal system (as diagnosed by the physician), (2) working in human service organizations and (3) working in the first-line public sector.

Table 1 provides information about the informants in the study. The informants consisted of female employees ($n=8$) on long-term sick leave with a wide range of musculoskeletal diseases or disorders. Five of the employees had associated diagnoses, and all of them resided in the south-west of Norway, in the Rogaland area.

Insert Table 1

The informants were recruited through their employer. Letters were containing both information from the employer and the research institute were posted to them inviting them to participate in the study. The employees on long-term sick leave were given information about the study and asked to complete a reply form in which they accepted to participate in the study.

3.3 Data collection

One interview was conducted with each informant. Three researchers took two or three interviews each. The interviews lasted from 30 to 90 minutes. They took place according to the informant's request at the research institution, their workplace or their home, and were audio taped and transcribed simultaneously. The data was collected over an 8-week period.

The interview guide was a combination of two semi-structured measures based on MoHO: Worker Role Interview (WRI) [48] and Work Environmental Impact Scale (WEIS) [41]. Follow-up questions were related to the individual stories that were told. Each tool includes 17 variables. The psychometric properties of WEIS [30], and WRI [15] have been tested in cross cultural studies, including a Scandinavian population participating. These studies found WRI and WEIS to be valid across cultures. Both WRI and WEIS seek to identify facilitating and inhibiting factors for RTW. WRI focuses on how the individual experiences psychosocial and environmental factors at the workplace. It is designed to collect information about how the individual identifies with being a worker, assesses

abilities and limitations, and how the environment influences the individual's experiences. WEIS focuses on the impact of the work setting on an individual's performance, satisfaction and well-being. The underlying concept is that employees are most productive and satisfied when there is a match between the environment and their skills. WEIS is designed to collect information about the physical and social work environment, properties of objects and work task demands.

3.4 Analysis

The interviews were taped and transcribed verbatim. Emotional outbursts and long pauses were noted in the text. Names and places were changed to ensure anonymity. The text first underwent a reduction process in which spoken language was transformed into written language, with inconsequential words being deleted. Meaning was condensed and categorized in order to identify work demands [31]. According to the recommendations of Kvale (ibid), the transcripts were first read through in their entirety in an attempt to discover natural themes. The aim was to find the implicit meaning in the explicit statements, and thereby identify work demands by transforming the meaning into themes. To express the described theme, a phrase was selected as an adequate code for a category. The physical demands were then identified. The demands were additionally marked as positive, negative or neutral factors for the work performance, based on the informants' descriptions. The described demands were then sorted into three categories according to whether the employee experienced the demand maker to be herself (the employee) or the employer/environment, or both. The analysis was planned, initiated and supervised throughout by one researcher (RWA). Each step in the analysis was performed in close co-operation between at least three researchers, thus facilitating discussion and dialog about the possible interpretations of the employees' stories. Disagreements were solved by discussion and consensus.

3.5 Ethics

The Rogaland RTW case study was clarified by the Norwegian Regional Committee for Ethics in Medical Research West in 2004 and the Norwegian Social Science Data Services, NSD, in 2005. Informed written consent was collected from all informants, who gave permission to have the interviews tape-recorded under the assurance that they could ask for taping to be stopped at any time. They also had the opportunity to withdraw from the study at any time without explanation. The ethical committee required that the scientists were not aware how many or to whom the invitations were sent. Informant employers were not given information about whom or how many employees

participated in the study from his/her company, or which part of the organization they came from. Client confidentiality was ensured by giving each informant a fictional name and an identification number. Two persons were responsible for keeping the names and numbers separate. Other members of the project group were only given personal information about the informants when absolutely needed, for example when interviewing them.

4. Results

The results are presented below according to the research questions.

4.1 Employee work tasks

The data revealed significant diversity in work tasks between the different occupational groups, but task similarities were also present. Typical work tasks for the employees working in a nursing home, home-based nursing or institution included supervision, office work, meetings, manual work, home visits and assisting in activities of daily living. Employees working at a school or kindergarten described work tasks such as teaching, parent-teacher meetings, student evaluations, lesson planning, office work, computer work, counselling and facilitating play. Employees working in a social security office or administration described service work, office work, meetings, computer work, counselling, home visits, supervision, casework and testifying at legal proceedings.

4.2 Employee work demands

An overview of the 51 work demands that were revealed is presented in the Appendix. The work demands described by the informants indicated that many different and specific demands affected workers within these occupational groups. A large number of work demands were often experienced to interfere with work performance in more than one way. For example, the demands of being attentive were experienced to interfere in both a positive, neutral and negative way.

4.3 Physical work demands

All the informants had musculoskeletal disorders or diseases, which could result in mainly physical demands. Seven of the informants also performed a wide range of physically demanding work tasks, such as lifting. It was therefore of interest to identify which of the demands were and were not physical. As shown in the appendix, the employees mentioned physical demands less often than demands of non-physical origin, but they

were still often described clearly and in precise terms.

Employees were subject to a high complexity of work demands simultaneously, as illustrated by the following statement by one of the informants:

"All the patient wants to get up as early as possible, and this is something we don't have the capacity to do. So it's a race, with constant time pressure because you're trying to get to all the patients. If you're too late you're greeted with sour comments from the patients....When I started to set limits in my relations with patients they became grumpy. So I continued to work the way the patients wanted me to".

The above passage relates to the activity of getting the patients out of bed in the morning. Different types of demands were mentioned for this activity: *physical demands*, related to getting patients out of bed; *cognitive demands*, such as time pressure and setting limits, and *emotional demands*, arising from interactions with bad-tempered patients and working in conflict with one's own limits. Setting limits might on the first hand be a cognitive demand, when considering where to set limits and why it is necessary. When performing work which involves relationship towards clients, customers or pupils, setting limits might also lead to emotional demands related to the way one acts towards the patient.

4.4 Positive, negative or neutral work demands

Information on the employee's descriptions of work demands as exerting positive, neutral or negative effects on the work performance is given in the Appendix. Activities containing physical demands were often described as negative, because they were experienced to be impossible to perform. Ann said: *"We have to carry a box with food. I can't do it"*. Eve felt the same way: *"Vacuuming, cleaning the floors, carrying...I can't do it. It's heavy. I also have problems making the beds"*. None of the physical demands were described as being only positive.

Demands such as planning, organizing, structuring and prioritizing work tasks were often perceived as negative, due to the pressure of the importance of being efficient and keeping deadlines. The employees had to be flexible and able to cope with stress, in addition to being service-minded and able to handle conflicts and set limits. This is described as the employees' choice between taking care of their own health and saving time. This was illustrated by the reply Doris gave when asked why she did not use technical aids when lifting a client: that it was not always a choice because the aid consumed far too much time, and she was pressed for time. Another informant put it this way: *"Few working in the public health-care service take care*

of themselves. We constantly think of the one who is receiving the help".

However, demands such as being able to organize own workload and being flexible and co-operative were also described as exerting positive effects on the employee's work performance. Also, the responsibility and professionalism in providing appropriate health care and interactions were experienced as positive work demands, as were the ability to engage in appropriate interactions, being empathic, handling conflicts and setting limits. Eve said: *"There are a few relatives that call often. Either we do an excellent job or the total opposite"*. She laughed and continued: *"But they're pleasant as well"*.

For some activities, demands such as being able to handle a large workload and being pressed for time were often described as negative. Difficulties were also experienced when setting limits in accordance with one's own beliefs and work capacity when efficiency was defined as being very important. Stagnant routines and challenging co-operation with employers and colleagues were other areas of concern. The employees also mentioned activities that demanded them to be empathic and patient towards clients, which was often emotionally strenuous. As one informant stated: *"I can feel socially filled up after I've been at work, 'cause I feel I give a lot of myself"*. Another explained it this way: *"I've heard them [the clients] scream in my head after I've come home for the night and gone to bed"*. To be service-minded was additionally mentioned as an emotionally positive demand in the work situation.

It was clear that the employees considered flexibility and variation when performing work tasks and routines as positive factors, as was coping with stress. Holly put it like this: *"We just put our heads in an open door to vent out our frustrations"*. Being valuable to others was also mentioned as an emotionally positive demand in the work situation.

Some cognitive and emotional demands were described as only positive. However, cognitive demands that were experienced as being positive could also be experienced as emotionally negative, and vice versa. This resulted in the diversity being perceived as higher in the cognitive and emotional demands than in the physical demands.

4.5 Claimers of the work demands

The experienced claimers of these demands are listed in the Appendix. Thirty-six of the demands were described as being claimed by the employee, seven demands by the employer or environment,

and eight were claimed by both. Thus, work environments were seldom experienced as claiming the demands and, if they were, this was often in combination with one's own and the employer or environmental claims.

The employees described that they had to be both mentally and physically able to meet the demands of the work tasks in order to master them. The work tasks and the work environment were viewed as given, almost rigid conditions. This was illustrated by Holly:

"If I was to work there I had to be healthy, 'cause they couldn't hand me any easier workload because that would put extra strain on the others [colleagues]. So I felt: Wow, I'm not healthy enough to start working again. I was dizzy when I left work that Thursday, and I thought: No, I have to consider my health...because if I start working again I will collapse. I'm just not healthy enough".

Coping with stress, handling conflicts, handling a large workload, being pressed for time, prioritizing, being flexible and showing perseverance were described as demands claimed by themselves, as were organizing, structuring and planning. Consequently, work-task failures were attributed mostly to themselves and seldom to the environment.

Demands such as managing daily routines, following procedures and working within crucial constraints were described as the claims of the employer and/or work environment. Other demands claimed externally were variation in work tasks, the social and physical environments, and especially the demand for efficiency. Rose described this as follows:

"Work tasks belonging to the day shift are very difficult to postpone to the night shift. Of course everything is possible, but all the shifts are pressed for time. If you postpone the work tasks you're just delaying the problem. Alternatively you have to let the patient wait a week before showering. Sometimes everything is just a mess".

5. Discussion

The aim of this study was to clarify the work demands from the perspectives of employees on long-term sick leave due to musculoskeletal disorders or diseases in human service organizations (e.g. the public sector), by answering the following question: How do employees on long-term sick leave with musculoskeletal disorders or diseases describe their work demands in relation to their work situation? The results generated the following two main findings: (1) employees mentioned mostly demands of non-physical origin; that is, cognitive and emotional demands, and (2) the claimer of the

work demands was most often the employee themselves, rather than the employer or work environment. These two findings are discussed below.

5.1 The demands were mostly non-physical

There were considerably fewer physical demands than non-physical demands in this study. The physical demands were stated in precise terms, and they were all experienced as exerting negative effects on the work performance, although several were also additionally stated as having positive effects. A previous study found that female employees on long-term sick leave (regardless of diagnosis) often viewed the physiological pain connected to their diseases and injuries as the basic reason for their inability to fulfil their work tasks [43]. A similar explanation might also apply in our study, where the employees were on sick leave due to a diagnosis of the musculoskeletal system. These conditions are often associated with pain, the intensity of which might increase when performing tasks that involve physical demands, leading to the perception that these tasks are impossible to perform.

Most of the demands described by the informants were cognitive and emotional, and were much more diverse than the physical demands. They often occurred simultaneously, interacting and being difficult to distinguish. Emotions have been suggested as important in service work due to interactions with clients and customers [49]. They have been shown to be a risk factor for burnout [10]. Two of the informants in our study had diagnoses related to mental health in addition to their musculoskeletal-system condition. Emotional demands were described by all informants. This is a rather surprising result given emotional demands are generally not strongly associated with risk factors for musculoskeletal complaints [4, 21] or work absence due to musculoskeletal complaints [3, 20]. However, emotional demands have been mostly studied in relation to burnout, with few investigations of their relation to musculoskeletal complaints, although there are indications that they could be a risk factor for the development of shoulder and neck complaints [19]. Our study extends this finding by showing that emotional demands are important also for those in an RTW process and on long-term sick leave due to a diagnosis of the musculoskeletal system. It therefore appears to be necessary to broaden perspectives when studying demands in relation to musculoskeletal health and related sickness absence, as underscored by the results from this study being in line with descriptions in the literature on demands within human service organizations [12]. Such

organizations can be very complex and large. They might produce associations between demands and complaints and sickness absence that are more complex than is predicted in many of the traditional models. These models are linking demands and risk of absence due to burnout or musculoskeletal complaints.

One noteworthy result of this study is that both emotional and cognitive demands were perceived as exerting both positive and negative effects on the work performance. A recent Swedish study showed that positive feelings about work were associated with high work attendance at human service organizations [14]. Previous research has also found that the psychosocial work environment has an important effect on whether working remains possible [18]. However, the assessment tools used have mainly focused on physical factors (ibid).

The results of this study also point to the importance of broadening the perspective for workers absent due to diagnosis of the musculoskeletal system. Therefore, occupational rehabilitation needs to include all categories of demands existing within the specific occupation.

5.2 The claimer of the demands were most often the employee themselves

The results showed clearly that the employees understood themselves to be the claimer of the work demands, which might be due to the contextual situation in which they were working. Many demands stated as being claimed by the employee occurred within activities involving the client. Clients are considered to be a *raw material* within human service organizations, referred to as “*the core activities of the organization are structured to process, sustain or change people who come under its jurisdiction*” [17]. A recent study involving teachers showed high ideals for teacher–pupil relationships, with teacher identities being related to their experience of this relation and them describing high ambitions and goals for this job [45]. When relations between the employee and client become very important, the employee might place much of the responsibility for the performance of work on herself, and trust his or her own abilities to a greater extent than in other occupational groups. A possible outcome is that the work becomes understood as the responsibility of the individual worker. This responsibility might lead to health deterioration on the longer term, giving rise to long-term sick leave. There are several potential mechanisms linking this individualized responsibility with long-term sick leave.

Previous studies have found that sickness presenteeism (working when sick) is higher for occupational groups within human service

occupations than for other groups, and that the rates of back/neck pain and fatigue are higher for those with high sickness presenteeism [6]. Working when sick might impair recuperation, which has been suggested to be an important mediator between job stressors and ill health [39], also leading to long-term sick leave. Another possible explanation is that the individual responsibility for work tasks (e.g. clients) results in symptoms being neglected or not being communicated to superiors.

This study used MoHO [28] as a conceptual theory for understanding work demands, and WRI [48] and WEIS [41] which are built on this model, as the qualitative assessment tools. MoHO has been seen as a holistic framework for understanding the disabled worker in his environments [29], thus providing a holistic approach for work related rehabilitation [40]. The demand-control model [26] has most often been used when assessing demands set by the environment [33]. The use of the demand-control model in our study would not have produced the same results. The large amount of emotional demands described would probably not have been captured, since they are not included in the model. This might also be the case for the large amount of demands claimed by the employee. If this finding is related to the context and not to health in organizations where the outcome is based on individual relations between an employee and client, demands other than those defined externally might exist for the work performance. These demands could be related to underlying norms and values for the profession or occupational group, and might not be easily captured by traditional epidemiological methods. One conclusion from a Swedish study of job demands and sickness absence among employees in the public and private sectors was that the demand-control model was better at predicting sickness absence in the private sector than in the public sector [34], which is due to the model failing to account for the special challenges within organizations that take care of and help other people. This finding should be considered when attempting to identify risk factors for and causes of absence, and also facilitation of RTW within these organizations.

5.3 Methodological imitations and strengths

Finally, this study had both specific limitations and strengths, which are described here using two of the Malteruds [38] criteria for qualitative research. *Transferability*: This study focused explicitly on the employees' experience of work demands using qualitative interviews. The strength of the method lies mostly in its capacity

to generate a wide range of descriptions, which helps to explore diversity. This also provides an internal validation of the results through unaltered quotations that represent the employees' authentic voices. The informants were selected from the Rogaland RTW case study and included a diverse sample of companies and employees. The present study was restricted to a specific group of occupations within a certain type of organization – employees working in human service organizations, whose histories and experiences might be relevant for workers within the same type of organizations.

Reflexivity: The reliability of informants depends on how well they understood the questions and how much they trusted that their confidentiality would be upheld, especially when they had been recruited into the study through their company. The informants could choose where to conduct the interviews, giving them some degree of co-determination. Qualitative interviews are strongly influenced by the relationship that evolves between the interviewer

and informant. The use of three interviewers with different strengths and weaknesses (to complement each other) was therefore considered a strength of the study. To ensure that the voices were as authentic as possible, laughter, crying, hesitations and strong outbursts were noted in the texts during the transcription process. All the analyses was discussed and executed in the co-operation with at least three researchers. Disagreements were discussed with close reference to the texts, or as a last resort, decided by a fourth scientist.

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Table 1: The informants

<i>No.</i>	<i>Fictional name</i>	<i>Age range (years)</i>	<i>Working area</i>	<i>Diagnosis*</i>	<i>Associated diagnosis**</i>
1	Ann	40–45	Social security office or public administration	Myalgia (M79.1) / Sciatica (M54.3)	Yes (P)
2	Sally	35–40	School or kindergarten	Juvenile Arthritis (M07.3/M08.8)	Yes (P)
3	Rose	30–35	Nursing home, home-based nursing or institution	Polyarthrosis (M15.9) AC	Yes (P)
4	Doris	45–50	Nursing home, home-based nursing or institution	Impingement syndrome of shoulder (M75.4)	No
5	Lisa	25–30	School or kindergarten	Headache (G44.8)	Yes (P and M)
6	Lynn	50–55	School or kindergarten	Fibromyalgia (M79.7)	No
7	Eve	50–55	Nursing home, home-based nursing or institution	Sciatica (M54.3)	No
8	Holly	50–55	Social security office or public administration	Rheumatoid arthritis (M06.9)	Yes (M)

* Diagnoses were verified through medical certificates and/or epicrisis (ICD-10 code), ** P = physical, M = mental

Appendix: Results overview

Work demands			
The way the work demands experienced to interfered with work performance			
The demand claimer (n=51)	Positive (n=23)**	Neutral (n=42)**	Negative (n=33)**
	<p>Be attentive / Be creative / Be flexible / Be mobile* / Be responsible / Communicate / Handle conflicts / Know one's expertise / Organize / Possess computer skills / Possess ergonomic skills / Possess full body movement* / Provide a sense of security / Set limits / Show empathy</p>	<p>Be attentive / Be creative / Be flexible / Be independent / Be mobile* / Be patient / Be responsible / Communicate / Cope with stress / Handle a large workload and being pressed for time / Handle conflicts / Handle unexpected situations / Have strength* / Keep deadlines / Keep tidy / Make decisions / Organize / Plan / Possess computer ergonomic skills / Possess full body movement* / Possess technical skills / Prioritize / Provide a sense of security / Provide professional and just treatment to all clients / Provide stability / Show empathy / Show perseverance / Show respect / Solve problems / Structure / Tolerate control and supervision of work performance</p>	<p>Be attentive / Be creative/ Be flexible / Be mobile* / Be patient / Be responsible / Communicate / Cope with stress / Handle a large workload and being pressed for time / Handle conflicts / Handle social situations / Have strength* / Keep deadlines / Organize / Plan / Possess endurance* / Possess ergonomic skills / Possess full body movement* / Prioritize / Provide professional and just treatment to all clients / Set limits / Show empathy / Show perseverance / Structure / Tolerate control and supervision of work performance</p>
	Employer herself (n=36)	Employer/environment (n=7)	
	Both employee and employer/environment (n=8)		

* Physical work demands (n=5). ** These demands total to more than 51 since, for example, some were described as both positive and neutral

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III

Challenging evidence-based decision making. A hypothetical case-study about return to work

RANDI W. AAS^{1,2,3,*} AND KRISTINA ALEXANDERSON²

1. PreSender, International Research Institute of Stavanger (IRIS), Stavanger, Norway

2. Division of Insurance Medicine, Department of Clinical Neuroscience, Karolinska Institutet, Stockholm, Sweden

3. PreSender, Faculty of Health Sciences, Oslo and Akershus University College, Oslo, Norway

ABSTRACT

Objectives of study: The essence of Evidence-Based Practice (EBP) is to make intervention decisions based on sound scientific evidence from systematic reviews (SRs), randomized controlled trials (RCTs), or clinical guidelines. The PICO-framework has been developed to secure that such knowledge is found by the practitioners. To guide the EBP-process, the so-called EBP-steps have been implemented. Still, studies reveal that implementing EBP has not been easy. The aim of this study was, therefore, to identify challenges and suggest possible solutions in translating scientific evidence into complex intervention decisions, as workplace intervention decisions'. **Methods:** A case-study-analysis was performed, comprising the following five components: (1) a referral about a constructed long-term sickness absentee with comorbidity, (2) a rehabilitation team receiving the referral, (3) the EBP-steps, (4) the PICO-framework, and (5) scientific evidence. **Results:** In general, the EBP-steps and PICO-framework seemed to construct a confined decision process. Furthermore, the evidence seemed to differ depending on whether it was from interventions with preventive, curative, or rehabilitative aims. Moreover, some evidences appeared to be from "good-for-all interventions", while others were from "tailored-type-of-interventions". Thus, a need to differentiate the evidences role, in terms of whether they inspired, challenged, enlightened, informed, or determined the intervention decision were revealed. **Recommendations for further research:** This study suggests solutions on ten revealed challenges, expanded EPB-steps, and developments of decision-making theories in complex practices as workplace rehabilitation.

Keywords: Knowledge Translation, Evidence-Based Practice, Workplace interventions, Sick Leave, Return to Work, Occupational rehabilitation

* Corresponding author: Randi W. Aas, IRIS, Box 8046, 4068 Stavanger, Norway. +47 91 18 22 66, randi.aas@iris.no

Introduction

There is a need for more documentary evidence from high-quality research on the effectiveness of interventions in practice, and policy-making (Bennett & Bennett, 2000; Gutman, 2009). Due to this need, evidence-based practice (EBP) has become a dominant paradigm within health care worldwide (Holm, 2000; Tse, Lloyd, Penman, King, & Bassett, 2004; Welch & Dawson, 2006). Thus, the demand from health authorities on practitioners to use the best available evidence has gradually increased (Murray & Frenk, 2001). This has also been the case for the field of workplace occupational rehabilitation, where clinicians face the challenge of how EBP should and could be used in situations where decision-making often concerns a single patient with high comorbidity, complex contexts and high work demands.

Today's EBP is strongly tied to the Cochrane Collaboration, an organization named after the epidemiologist and physician Archie Cochrane who, in an essay in 1979, claimed that: "It is surely a great criticism of our profession that we have not organized a critical summary, by specialty or subspecialty, adapted periodically, of all relevant randomized controlled trials" (Cochrane, 1979). In this spirit, the first Cochrane Centre in Oxford, UK was founded in February 1992 by the British National Health Service "to facilitate the preparation of systematic reviews of randomised controlled trials of health care" (The Cochrane Collaboration, 2010). Today the Cochrane Library provides approximately 6,500 Cochrane systematic reviews (SR) of interventions, and 650,000 clinical trials, and has also contributed to enormous progress within intervention research. The sibling-databases of the Cochrane Library, the OTseeker and PEDRO, for occupational therapists and physical therapists, respectively, also exclusively provide results from Randomized Controlled Trials (RCTs) and SRs.

Using scientific evidence from SRs and RCTs appears to guarantee the prioritization and provision of efficient interventions at a national or group level. Whether such scientific evidence

is able to determine the intervention-choices in individual cases with complex etiology and comorbidity might, however, be questionable (Greenhalgh, 1996; Sestini, 2008). Still, the most common definition of evidence-based medicine, which also has been widely used in health professions and fields outside of medicine, defines the target as being the individual patient and the process as being an intervention decision: "Evidence-based medicine is the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients" (Sackett, Rosenberg, Gray, Haynes, & Richardson, 1996).

Practicing *EBP* is today first and foremost about using knowledge from *SRs*, *RCTs*, and Clinical Guidelines. The PICO-framework has been developed to secure that such knowledge can be found by practitioners (American Speech Language Hearing Association, 2010; Melnyk & Overholt, 2002; Miller & Forrest, 2001; Stillwell, Fineout-Overholt, Melnyk, & Williamson, 2010; Stone, 2002). Moreover, to guide the process of doing EBP, the EBP-steps have been implemented (S Bennett & Bennett, 2000; Norwegian Knowledge Center for Health Care, 2010; Porzolt, et al., 2003; Stone, 2002). All these components should make EBP possible.

EBP has a highly recognized aim – to use the best knowledge in intervention decisions. However, moving toward EBP is not always easy (McCluskey, et al., 2005). Cameron and colleagues (Cameron, et al., 2005) showed that most practitioners do not use these sources of knowledge in the intervention planning process, and despite the availability of sound evidence, there is a widespread failure to adopt this knowledge (Forbes & Griffiths, 2002; Grimshaw & Eccles, 2004). Health care professionals report a low level of knowledge, skill, and involvement in EBP (McCluskey, 2003). This has prompted several studies attempting to identify the obstacles to implementing EBP. These obstacles include lack of knowledge, confidence, research skills, time, databases, and computers, but also large caseloads, staff shortages, and information

deficits and overload (S. Bennett, et al., 2003; Welch, 2002).

Interest in knowledge translation activities is reportedly increasing (Sweet, 2004); (Buchan, Sewell, & Sweet, 2004); (Hubbard, Parsons, Neilson, & Carey, 2009; Kitson & Phil, 2009; Lencucha, Kothari, & Rouse, 2007; Straus, Tetroe, & Graham, 2009; Woelk, et al., 2009) with attempts to fill the gap between scientific evidence and decision-making in practice. Several attempts have been made to increase the evidence uptake in practice (Buchan, et al., 2004; Sweet, 2004). National implementation research programs have for example been conducted in the Netherlands, the United Kingdom and the United States (Buchan, et al., 2004).

There are many arguments for why the translation of scientific knowledge can be problematic, sometimes metaphorized as the gap between science and practice (Buchan, 2004). EBP is suggested to be “the bridge” between these two separated “cliffs” (R. W. Aas, 2002). There are therefore three possible targets for improvements and changes to increase the translation of scientific evidence in intervention decisions: the patient and the practitioner (cliff A), the scientific evidence (cliff B), and the translation processes (the bridge). Considerable effort has been devoted to the two cliffs. Scientists work hard to ensure the quality of scientific results, with the Cochrane Collaboration having contributed enormously to increasing the quality of experimental studies, and to systemizing and synthesizing existing RCT studies to systematic review to increase their availability to practitioners. The practitioners have also been a frequent target for behavior changes, often seen as the core solution for better evidence uptake in practice. In contrast, less has been done to explore and promote the translation process (the bridge).

These efforts are all based on how we define and understand and view the patient and the practitioner, the scientific evidence, and the translation processes. Whilst accepting the existence of a gap between evidence and practice, it appears that there remains an implicit assumption that scientific evidence from high-

quality RCTs is relevant and suitable in all types of intervention decisions, in any case and situation.

An increasing number of persons have complex health problems. One example is employees with non-specific Low Back Pain (LBP); one of the most frequent and costly health problems in welfare states (Airaksinen, et al., 2004; Koes, van Tulder, & Thomas, 2006; van Tulder, et al., 2006; Webster, Courtney, Huang, Matz, & Christiani, 2005). According to WHO, low back pain is a leading cause of disability (Ehrlich, 2003). Musculoskeletal disorders are the most often used diagnoses when sick listing employees in many countries (Alexanderson, et al. 2003). As many as 90 percent of those with LBP have a non-specific LBP (Koes, et al., 2006), e.g. a diagnosis based on exclusion of specific pathology. Non-specific LBP is characterized by lapses and relapses and comorbidity (Hestbaek, Lboeuf-Yde, & Kyvik, 2006; Ritzwoller, Crounse, Shetterly, & Rublee, 2006). Comorbidity in LBP is associated with more frequent work disability (Nordin, et al., 2002). Ensuring the uptake of scientific evidence is feasible for health problems of this type, is crucial for further development of EBP within workplace occupational rehabilitation. More knowledge about translational challenges within this type of practice is needed.

Most of the literature has focused on how clinicians could and should change behavior to become more evidence-based (Grimshaw & Eccles, 2004). This might give the impression that the translation challenge is only a technical problem rather than a fundamental or normative one, lending itself to a solution by educational or collaborative efforts and by increasing available recourses. McCluskey and Lavarini (McCluskey & Lavarini, 2005) showed that providing education improved knowledge but did not change behavior. It is, therefore, questionable whether the willingness to change is the main problem, or if a more fundamental translation challenge is involved. Others see the solution to this evidence uptake problem solved by producing more research knowledge. It seems that we still have limited knowledge of which challenges are involved in evidence

uptake processes in practice, and these two solutions might be too simplistic.

The aim of this study was, therefore, to identify the challenges and possible solutions in translating scientific evidence from guidelines, SRs, and RCTs into intervention decisions, by analyzing a hypothetical case-study including comorbidity, complex workplace contexts and high work demands.

The components

Design

A case-study was constructed and analyzed to identify possible translational challenges. The case-study comprised the following five components (see figure 1): (1) a physician's referral of Denise, an employee on long-term sick leave with LBP and comorbidity and with a need for workplace interventions (see figure 2), (2) a rehabilitation team at a outpatient RTW-clinic receiving the referral, (3) the six EBP-steps, and (4) the PICO-framework. Additionally, from using the EBP-steps and the PICO-framework the last component was identified; (5) scientific evidence from a high-quality randomized controlled trial (see figure 3).

First, to create a typical sick listed employee in the referral, the empirical data of 30 employees with sick leave were analyzed. Second, the six EBP-steps and the PICO-approach were used to manage performing an EBP-process. Third, the challenges in the EBP-process were identified through analyzing the reflections that followed the process. Finally, the challenges revealed in this process were isolated, presented one by one and finally systematized into a suggested revision of the EBP-steps.

These five components will be further described below.

Insert Figure 1

Component 1: The referral of an employee on long term sick leave

Figure 2 presents the content of the physician's referral, and gives information about Denise, a secretary in the public sector with high comorbidity. The employee case used here was developed from analyses of the core characteristics of 30 employees on long-term sick leave, who were followed for approximately eight months each in the Rogaland Return to Work (RTW) study (Lindoe, Bakke, & Aas, 2006; R W Aas, Ellingsen, Lindoe, & Möller, 2008; R W Aas, Thingbø, Holte, Lie, & Lode, in press, 2010). Several interview transcripts from 135 interviews with these employees and their immediate supervisors were analyzed, but also documents (n= 250) from health care, social insurance office, and employers were used. Qualitative content analysis (Cavanagh, 1997; Downe-Wamboldt, 1992; Hsieh & Shannon, 2005; Priest, Roberts, & Woods, 2002; Woods, Priest, & Roberts, 2002) were used to identify typical features, such as age, gender, family situation, occupation, health status, health problems, functioning, work ability, work capacity, and etiology across the cases. The aim was to be able to reconstruct three typical employees on long-term sick leave. Denise was one of these typical absentees which were revealed from this analysis. Denise is thereby to be seen as a typical long-term sickness absentee, from a Norwegian working life and social security systems context (see figure 2).

Insert figure 2

Component 2: A rehabilitation team at a clinic

A hypothetical rehabilitation team received the referral about Denise. The team was organized in a RTW- outpatient clinic, and were working in close contact with the employees, employers and workplaces. The RTW-clinic have a multi-professional staff; a physician, an occupational therapist, a physiotherapist, and a psychologist. From this team, the occupational therapist Eve was given the responsibility as the case manager

of Denise, involving taking contact towards the workplace, social insurance staff, and other health care services. The RTW-clinic had applied an evidence-based approach. Eve had learned how to implement and practice EBP according to the EBP-steps and PICO framework, and exhibited none of the problems revealed in the literature as often representing obstacles to EBP. She was confident in performing EBP.

Component 3: The EBP-steps

In the hypothetical case-study the EBP-steps were used. Here they will be further described as they appear in the literature. The 4, 5, 6, or 7 EBP-steps have been developed to guide the process of performing evidence-based practice (Greenhalgh, 1996); Norwegian Knowledge Center for Health Care, 2010; American Speech Language Hearing Association, 2010; Merijohn, 2007; Melnyk, 2010). Summing up the literature, they involve the following components: (1) ASSESS- acknowledge the need for information and reflect, (2) ASK- create answerable questions, (3) ACQUIRE- search for knowledge in the scientific literature, (4) APPRAISE- critically appraise the relevance and validity of information in the literature, and (5) APPLY- apply good knowledge and make the decision. Some have also included a sixth step; *evaluation* (Norwegian Knowledge Center for Health Care, 2010) or *dissemination to colleagues or organizations* (Melnik, 2010). A few exceptions to the steps as specified above have been found in the literature; One publication included a step after Appraisal, called *Integrate the evidence with clinical expertise and patient preferences and values* (Melnik, 2010) and a step where the ASK-step should first be answered on basis of professional expertise before the scientific literature provides the answers (Porzolt, 2003). Bennett and Bennett (Bennett & Bennett, 2000) have put their four EBP-steps (Ask, Search, Appraise, Use) as the third frame, outside two other frames; (1) client context and (2) occupational therapy treatment process/therapy context.

Component 4: The PICO-framework

In the hypothetical case-study the PICO framework was also used. Here it will be further described. The PICO framework, where “P” stands for the type of patient, “IC” stands for the type of interventions and co-interventions, and “O” stands for the outcome, has been developed to enable the practitioner to ask what is often called a good question, answerable question, clinical question, appropriate question, searchable question, or a well-built question (Richardson, Wilson, Nishikawa, & Hayward, 1995); (Larue, Draus, & Klem, 2009; Stillwell, et al., 2010; Melnyk & Overholt, 2002; Stone, 2002; Miller & Forrest, 2001). The PICO-framework is to be used in step 2-ASK of the EBP-steps. The aim of using the PICO-format is to be able to target the relevant sound evidence in the scientific literature, in spite of information overload.

Component 5: The scientific evidence

The fifth component in the hypothetical case-study was scientific evidence from systematic reviews, RCTs and clinical guidelines. These will, according to the system of grading evidence in Cochrane Collaboration (GRADE) be “*high*”, “*low*” or “*very low quality of evidence*”.

Applying the EBP process to the hypothetical case-study

After describing the five components involved in the hypothetical case-study (see figure 1), the EBP-translation-process, which involves going through the EBP-steps, will now be described.

1. ASSESS: The case-manager Eve start with *assessing* the knowledge-base for the case, in order to provide evidence-based treatment to the patient. The team’s knowledge of Denise was so far only based on the information in the referral. Eve determined that the case was multi-factorial. She knew, from the EBP course she had attended, that scientific evidence from SRs and good RCTs could provide high quality of

evidence. That *evidence* is often easy to assess and apply when it is formulated as clinical guidelines. Hence, she started with this type of knowledge.

2. ASK: Eve had learned how to ask answerable questions by using the PICO framework. She attempted to determine which group of patients Denise belonged to, remembering that the “P” most often refers to the person’s diagnosis. However, Denise had several diagnoses, while most of the literature was diagnosis-specific. How could this discrepancy be resolved? Eve decided to choose one of the diagnoses, the LBP, which she believed was the disorder with most impact on Denise’s work ability. “P” could also refer to the type of job Denise has, so Eve needed to find literature on people working as secretaries in service occupations. She also needed to find studies about women in the same age group as Denise. She then considered the “I” and “C” components of the PICO framework, eliminating therapies that were similar to those Denise had tried previously. The physician also communicated a need for more workplace targeted interventions in the referral. It was obvious which outcome “O” was relevant, since Denise wanted to get back to work as soon as possible. Eve formulated the following PICO question: *“Which interventions are effective for a fast return to work for a 35-year-old female secretary with chronic low-back pain?”*

3. ACQUIRE: First, Eve looked for clinical guidelines concerning chronic LBP. She found that for conservative treatments, the European Guidelines for chronic non-specific LBP (Airaksinen, et al., 2006) recommend cognitive behavioral therapy, supervised exercise therapy, brief educational interventions, and multidisciplinary (bio-psycho-social) interventions. Specific workplace interventions were not covered in those guidelines. Eve then conducted a literature search in Cochrane Library. Few of the studies she found assessed the outcome regarding RTW – most of them focused on outcomes such as pain and function. She systemized the interventions in the studies she found, using the WHO ICF’s health and

functioning domains (WHO, 2001) (see Appendix 1). Eve found that the interventions in the studies were almost exclusively aiming at the patient’s body functions or body structures, but considered these types of interventions to be irrelevant to Denise at this stage, due to her treatment history. Just a few had workplace components in the interventions.

Eve identified a review about bio-psycho-social rehabilitation, for chronic low-back pain (Guzman, et al., 2006). It described conflicting evidence regarding the effectiveness on vocational outcomes. Eve was not sure how to use this finding. She finally found an article that could be relevant to Denise’s situation, which described an intervention called *a multidisciplinary rehabilitation program for back and neck pain* (Jensen, Bergstrom, Ljungquist, & Bodin, 2005). The authors concluded that this intervention increased RTW in women aged 16–60 years, working in service/care occupations, and suffering from back/neck pain. Figure 3 presents the abstract. Eve decided to proceed with this promising study.

Insert Figure 3

4. APPRAISE: The above study could be relevant to Denise. However, those included in the study had been sick-listed for spinal pain for a maximum of 6 months, whereas Denise had been full-time sick-listed for 9 months. Eve wondered if this made the study irrelevant? The third intervention described in the article was called behavioral medicine rehabilitation (BM), for which the outcomes were superior to those for the other two programs and for the control group.

The mean number of sick-leave days for women was 201.3 less in the BM intervention group than in the control group. Eve considered this to be a good result for “the mean person” in the group, but was eager to determine the effects for a specific person such as Denise. She found that the group consisted of only 20 women and wondered whether the power of the study was sufficient to translate the results to Denise. Eve tried to find the spread of values for the 20

women in this group. The 95 percent confidence interval for the group of 20 women in the BM group were extremely wide; 1.3 to -403.9, e.g. among 95 percent of those participating in the study the best result showed a mean reduction of 403,9 sick leave days more than the control group at the “best” and 1,3 sick leave day more at the “worst”.

Eve felt that she needed more information about who really did and did not benefit from the intervention. For example, were there only a few who exhibited an enormous effect, while most of the 20 women experienced only moderate, small, or even adverse effects? Did they have neck or back pain, what types of occupation did they have, which types of companies did they work in, and what type of work did they have? Eve concluded from the confidence interval that only a few of the women – possibly only one or two – experienced a small adverse effect; that is, having more sick-leave days than the average participant in the control group.

5. APPLY: Eve was not sure if this intervention program would go with Denise’s personal preferences, health condition, type of work, occupation pattern, and workplace environment. If the answer to this was “yes”, more information was still needed about how to apply the program in her case, also taking the resources and competence available into consideration. If the intervention program applied to Denise differed too much from the original program, it would unlikely produce the same positive outcome. Eve decided to contact the first author of the study to get information about the intervention program, so that the rehabilitation team could take a closer look at the content. Eve was eager to be guided by the scientific literature, but experienced that the decision regarding type of intervention was still far away, even though the EBP-steps were completed.

The ten challenges

In the following section, the challenges identified in the above EBP translation-process

will be described and to some degree discussed. In general, the EBP-steps and PICO-framework seemed to construct a confined decision process, only giving input in the intervention decision process from one type of knowledge; e.g. the scientific knowledge from guidelines, SRs, and RCTs. None of these EBP-tools, as they were specified made it natural to seek other types of knowledge. This fact might today be under communicated. This seemed not to be enough for deciding on the appropriate intervention in the case of Denise.

At least ten technical, normative, and fundamental translation challenges arose when using scientific knowledge to decide which intervention to recommend in Denise’s situation (see Table 1). Recalling the PICO format, one challenge was directed at the P, *patient* (number 1), six challenges at the I, *interventions* or the C, *co-interventions* (numbers 2, 3, 4, 8, 9 and 10) and two challenges at the O, *outcome* (numbers 5 and 6). One challenge (number 7) was more fundamental, and went beyond the PICO framework. These ten challenges are presented and discussed in the following subsections.

Insert Table 1

I. Sorting and subsuming into predefined categories: Like many people on long-term sick leave, Denise had both co-diagnoses and co-disabilities. The etiology of her situation was not easy to determine due to the complex pattern of possible causes at work, in her family situation, and from inherited disposition. Comorbidity in terms of subjective health complaints are often present in people on long-term sick leave. Eve found that the scientific literature from RCTs has idealized and isolated the diagnoses and disorders, rather than trying to mirror the complexity in real life caused by comorbidity. Thus, the scientific knowledge was organized into predefined categories, and when meeting a real patient it was necessary to subsume the patient under the correct category. In the EBP-literature, the disease is typically considered as a major category, but also the gender, age group, trades, occupations,

represent sorting challenges in this case. Eve had to choose interventions that covered only parts of the problem. However, multilevel interventions might be more suitable for comorbidity and complex health problems. These constructed elements of the study represent a type of sorting challenge in this EBP-process. Is it possible to fit the patient into all the classes, and is the available evidence really relevant for the given patient?

II. Degree of intervention flexibility: Another revealed challenge was how flexible or fixed the intervention identified in the literature appeared to be. Some of the evidence found in the search in this case-study might be impossible to adopt due to its content being too rigid to allow adoption to the rehabilitation process of a particular individual. Sometimes the evidence is more like a flexible “frame-type intervention” that could be filled with “tailored interventions”. One example of this is the widely recognized program Supported Employment, which has been shown to be effective in RCT studies at a group level, with reported successful implementation in practice (Handler, Doel, Henry, & Lucca, 2003). This intervention might be translational due to it containing flexible supportive and organizational elements that make it possible to tailor the content of the intervention to the individual, her/his tasks and environments.

III. Possibility of re-using interventions in new situations: The case of Denise revealed another, more technical challenge. One of the most important factors for the re-use (implementing interventions in new situations) of evidence is the availability and quality of the documented intervention program used in the study. In this case Eve was lucky, since the research team had a detailed documented program available for others. This crucial detailed information is often impossible to find, either in the article or in any other documentation such as information given in clinical trial registers. One solution could be to include the description of the intervention

program in the peer review process, and to make such program descriptions available within Cochrane Libraries, OTseeker, and PEDro.

IV. Interventions available in the literature: The intervention decisions in the case of Denise, was also influenced by interventions that were available in the scientific literature. This is especially important also as a consequence of demands from external stakeholders towards health care professions, which claim interventions not being reimbursed if there is no research evidence supporting their effectiveness. Can we assume that the interventions that are available in the scientific databases are those that are in use in practice? Usually, either the scientists or their financial sources decide which interventions will form the focus of a study. If researchers are not involved in collaborative activities toward practice, this might result in a large gap between interventions used in practice and the interventions tested in RCT studies. It is also possible that interventions that are already focused on in the literature will more often be the target for new studies.

V. Translating average group results to individuals: How can the evidence that an intervention is more effective for the average intervention group than the control group be used when deciding interventions for a specific person? The story of Denise and Eve revealed a lack of important information in the traditional format of RCT articles. The spread in the results has a different profile in each study. But which characteristics did those who did or did not benefit from the intervention have? Most reports do give information on the results spread, such as by quoting standard deviations or confidence intervals. Even though such measures give an idea of the variation in effectiveness among those that have received the intervention, this information might be insufficient for making decisions in individual cases, and hence it might be beneficial to provide plot diagrams and more descriptive text. A spread that is normally distributed and thereby not predictable from the registered patient variables might result in

important variables being inaccessible. Moreover, we might wonder if the evidence gets easier to use if less is known about the patient.

VI. Relevance of the outcome: Many interventions today are not valued as effective, due to different circumstances. Practitioners as Eve, get confused when trying to work based on the available evidence, since they often find in reviews a message of low quality of evidence or of conflicting results. According to the GRADE-system used in the Cochrane Collaboration the quality of evidence would be 'High' if the summary is of several randomized trials with low risk of bias, but the rating of quality becomes lower if there are concerns about design or implementation, imprecision, inconsistency, indirectness, or reporting high risk of bias. The problem that is not mentioned as often is that the studies did not assess relevant outcomes. It appears, in this hypothetical case-study, that there is more focus on personal and domestic domains than on outside domains such as leisure, school, and work activities. A consequence of outcome measures being based on few health constructs is that some interventions are considered ineffective, with only a few outcome measures being included in the studies. Here ICF (WHO, 2001), with its different components, could be used as a frame of reference to cover more aspects of the wanted outcome.

VII. Role of the scientific evidence: One of the main issues that arose in this hypothetical case-study was about which role scientific evidence should or could have in intervention decisions in individual cases. One distinction was whether evidence informs clinical choices or determine them (S Bennett & Bennett, 2000; Strand & Hannestad, 2004). Applying these different roles of the evidence in to the ICF's components could theoretically produce different decision profiles (see Figure 4). Considering the role of the scientific evidence in making each decision to be on a continuum where five point ordinal scale describing how the evidence gradually more and more were deciding the decision –

from *inspiring, challenge, enlighten, inform* to *determining* the decision – might produce the results visualized by curves in figure 4. When the intervention decisions are aimed at changing the body structures or body functions, such as surgically and pharmacologically, figure 4 shows that the evidence often might determine the intervention decision. For interventions aiming at participation restrictions, the role of the evidence might more often be to inspire, challenge or enlighten the decision.

Insert Figure 4

We can consider the role of the scientific evidence in Eve's decision process. In many ways, the use of literature produced more questions than answers, thereby stimulating Eve to engage in a reflective decision making process, where the scientific evidence neither determined nor informed practice, but instead resulted in new input on how to proceed in the process. The role of the evidence was more to question, challenge, inspire, or even enlighten the choices. The practitioner thereby obtained a new and valuable perspective on the decision process to add to the knowledge she already had, but did not the answer the question of which intervention to choose. The evidence could also sometimes confuse the pre-existing experience-based practice that is already well established, which might have arisen from the a priori expectation that we will find absolute answers in the scientific literature that could determine the intervention decisions.

VIII. Aim of interventions: This hypothetical case-study revealed another question. The aim in different cases and different steps varies within and between single cases from prevention to cure, rehabilitate, or maintain health. In the case of Denise, the primary aim of the intervention was rehabilitation, and the challenges might have been different if the decision-making was focused on curative or preventive aims. We might therefore question if these different aims could be valuable in better understanding the intervention decision. Does

the scientific evidence from an intervention aiming to be preventive or curative differ from that aiming to be rehabilitative? Before discussing this further, we need to consider another possible challenge.

IX. Complexity of interventions: The interventions found in the literature during this hypothetical case-study could be placed on a continuum from very simple to very complex, which appears to influence the translational role of the evidence. One example of a simple intervention could be arm support for computer work, while a more complex intervention could be those described as multilevel or bio-psycho-social programs. In our case, Eve chose multilevel interventions since these might be the most effective in complex cases. At the same time, such interventions might challenge the translation process the most. Simple interventions might be easier to translate, and might more often determine the intervention decision.

X. Potential to tailor interventions: This hypothetical case-study was also able to investigate if it is possible to differentiate between what we could call “good-for-all interventions” versus “tailored interventions”. Evidence from good-for-all interventions might be looked upon as more determinate in its role, and tailored interventions might be looked upon as ones that could enlighten and challenge the existing practice.

Good-for-all interventions are often *preventive*, thereby aiming merely at preventing health problems from occurring rather than at changing a condition. These interventions usually do not harm anyone. Good-for-all preventive interventions could be *variation in sitting positions, breaks in office work, physical exercise, and lifting instructions*. Good-for-all interventions might also be aimed to be *curative*, then representing good-for-all interventions in a defined group. *Advice to stay active, water gymnastics, acupuncture, and drugs* are examples of curative aimed interventions that could be given this label. “In a

defined group” means that they are significantly more effective for the average person in the intervention group than in the control group.

In contrast, tailored interventions would always be strongly influenced by individual needs and preferences, but also the special conditions, tasks, and contextual factors. Personal narratives of the story from the patient’s point of view might often in such cases be the strongest determinant. Figure 5 illustrates this continuum, together with the aim of the intervention (challenge 8), and the different role of the evidence in the translation process (challenge 7). Treatment procedures, manuals and clinical guidelines might appear to be more applicable in the top-left quadrant of the diagram.

Insert Figure 5

Overall discussions and implications

The main focus of this study was to obtain a deeper understanding of the EBP-translation process of scientific knowledge into intervention decisions, by using the recognized components available to perform EBP (EBP-steps, PICO framework and available evidence within EBP-bases). A case-study was constructed to identify challenges that arise when trying to implement EBP. Table 2 propose ways of handling the challenges revealed in this experiment.

Insert table 2

Despite the rehabilitation professional Eve being confident in implementing EBP, both technical challenges, but also more fundamental or normative challenges arose. In general, forcing the EBP-steps created a confined decision process, limited to producing valuable and important knowledge from one type of literature (guidelines, SRs, and RCTs). All other types of knowledge needed to decision-making were not an output of forcing the EBP-steps and using the PICO framework. It seems that the patient’s knowledge and preferences and the

professional's expertise is taken for granted and thereby under communicated in these tools. Sestini (Sestini, 2008) argues that the EBP-process is based on Popper's criterion on falsification, objective knowledge, and absolute truth. When using these EBP-steps in the training of medical students, the teachers noticed a growing reluctance to accept this strategy as students advanced in their medical training (Porzolt, et al., 2003). Even though EBP facilitators advocate that EBP is more than guidelines, SRs, and RCTs, it seems like we need a better strategy for integrating scientific evidence with expertise and patient knowledge. Figure 6 provides a suggestion of revised EBP-steps which brings more knowledge into the intervention decision.

Insert figure 6

Often it is assumed that the scientific evidence can be applied to a real patient by the practitioner directly and literally without any further effort, as by magic providing the answer of which intervention should be applied in that particular case. EBP often advocates a "copy-and-paste" action rather than a demanding process, and becomes confused when this is not actually possible. As Erikson claimed (Erikson F, 2000), evidence-based practice in human service field will never work. Considering practice from the point of view of episteme, rather than of phronesis is not to view them as actual practices, only as general characterizations of practices. This hypothetical case-study shows that the goal of the intervention appears to decide the role that evidence has, and the complexity of interventions, together with their aim, appears to also have an impact on the translation process.

While the Cochrane Collaboration are working hard to ensure the quality of scientific work, we might wonder if we have got lost in the *translation* process. It might also be commonly believed that EBP gives easy answers, while in real life this often raises new questions. At the same time we also have experienced that scientific knowledge from SRs/RCTs has

contributed to new perspectives among practitioners that unquestionably have had a positive impact on their insight.

What are the implications of this hypothetical case-study for future research? There are still limited knowledge within occupational rehabilitation, and too few RTCs about RTW-interventions, especially workplace interventions. However, the lack of differentiating the role of evidence in decision-making might have overestimated the importance of RCTs in intervention research. When adapting experimental design to decisions in complex cases, the contexts will surely influence the outcome. If scientific knowledge is to inform and inspire decisions, rather than determine them, different types of intervention research might be more valued than today. For example, a *single case-study* reporting in detail a successful treatment for one patient could inspire and inform, and in this manner influence the intervention decision in a positive way. Case-studies would be easier to interpret as informative, as they would not "pretend" to have a determinative role that should be directly transformed into interventions decisions in specific cases. The quality of the studies is the main concern for the future, and for example, high quality observational studies almost always show the same results as RTCs (Rosen et al. 2008).

This hypothetical case-study reveals that there is no "quick-fix" solution in complex practice, and that we need to reconsider the role the scientific evidence should have in intervention decisions. A new theory about decision-making might be needed. If so, then there is a strong need to explore decision-making as a phenomenon and focus not only on *if* it works, but *how*, *when*, and *why* a positive change occurs in the life of the clients. As Miles et al. claimed (Miles A., Loughlin M., & Polychronis A., 2008), evidence-based medicine is losing its influence, while the promises and potential of *personalized medicine* are increasingly recognized. The development of decision-making within the field of workplace rehabilitation should include the role of scientific evidence in high-quality intervention decisions. However, its role needs

to be discussed more fully. By focusing too much on maximizing the percentage of patients who benefit from care according to current scientific evidence (Greenhalgh, 1996; Grimshaw & Eccles, 2004; Grol & Wensing, 2004), it tends to be forgotten that in specific patient cases, as Denise's case, other types of knowledge might be superior to scientific evidence when all the available information has been appraised.

This innovative study methodology might have some limitations. The intention of this design was to capture an almost real situation when

practicing EBP. Even though the case of Denise were not a real life case-study, it was based on real sickness absentees characteristics, real evidence from the literature, real tools for practicing EBP (PICO and EBP-steps), and a

literature search were actually performed. Still, constructing real life would never be real life. The consequence for the results might be that we would probably have needed several real life cases to experience all these 10 challenges. Still, the challenges revealed would not likely be different, as they all are based on general features of real life practice and science.

Figures and tables

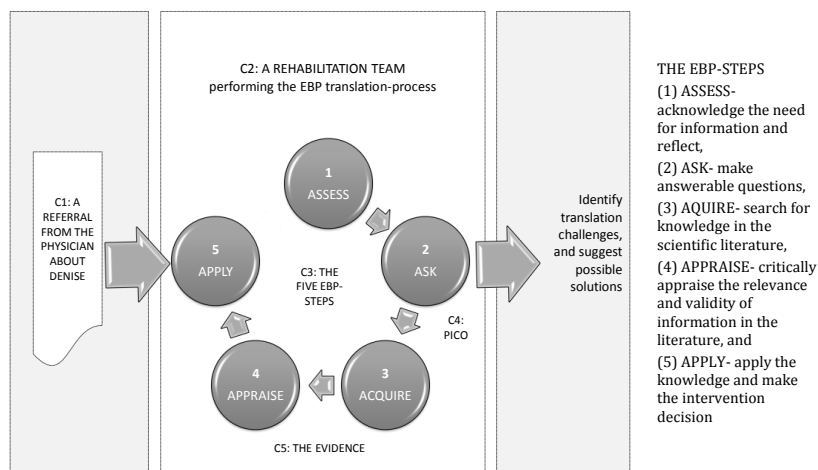


Figure 1: Overview of the five components (C1-C5) involved in the EBP translation-process in this hypothetical case study

REFERRAL TO THE OCCUPATIONAL REHABILITATION CLINIC

Patient: Denise Goodwill

Born: 10.10.1975

Diagnosis: Sciatica L80, Myalgia IKA/INA L99, Neck symptoms L01, and Headache IKA N01

Anamnesis and reasons for referral: Denise is the mother of three children. During the last 9 months she has been on full-time sick leave from her position as a secretary in the public sector. She has different types of non-specific musculoskeletal disorders, including low-back pain, neck pain and headache. She also has described many years of family problems, which she identifies as one of the causes of her health status, together with other factors such as work positions, workload and inherited dispositions. Her health situation has been thoroughly assessed by repeated x-rays, MR and clinical assessments during the last six years. Different interventions have been tried. Back surgery (arcotomi L3/L4) has not reduced pain. For several years she has attended physiotherapy and chiropractic clinics, but each time this has relieved pain for only a couple of weeks after the treatment. She has also performed physical activity programs, also with no lasting effects. She has tried to go back to work several times. She enjoys her job, and has a strong desire to return to work. At 12 months sick leave duration she will be transferred to a disability pension unless some new interventions change her situation. She considers herself to be far too young to stop working, and is suffering from a mild depression due to this problematic situation. The depression is now successfully treated by antidepressants. Due to the reactive nature of this depression, a more thorough investigation about her workplace situation or a more comprehensive occupational workplace program might give new possibilities for her. I therefore refer her to the occupational rehabilitation outpatient clinic and believe it is important that the workplace aspects will be more included than the previously attempts to bring her back to work, which has mainly focused on changing the patient.

15th of January 2011,

Dr. Jackson

Figure 2: The physician referral regarding the hypothetical case Denise, used in the case-study

A 3-year follow-up of a multidisciplinary rehabilitation programme for back and neck pain

Abstract: The aim of the present study was to evaluate the long-term outcome of a behavioural medicine rehabilitation programme and the outcome of its two main components, compared to "treatment-as-usual" control group. The study employed a 4x5 repeated-measures design with four groups and five assessment periods during a 3-year follow-up. The group studied consisted of blue-collar and service/care workers on sick leave, identified in a nationwide health insurance scheme in Sweden. After inclusion, the subjects were randomised to one of the four conditions: behaviour-oriented physiotherapy (PT), cognitive behavioural therapy (CBT), behavioural medicine rehabilitation consisting of PT+CBT (BM) and a "treatment-as-usual" control group (CG). Outcome variables were sick leave, early retirement and health-related quality of life. A cost-effectiveness analysis, comparing the programmes, was made. The results showed, consistently, the full-time behavioural medicine program being superior to the three other conditions. The strongest effect was found on females. Regarding sick leave, the mean difference in the per-protocol analysis between the BM programme and the control group was 201 days, thus reducing sick leave by about two-thirds of a working year. Rehabilitating women has a substantial impact on costs for production losses, whereas rehabilitating men seem to be effortless with no significant effect on either health or costs. In conclusion, a full-time behavioural medicine programme is a cost-effective method for improving health and increasing return to work in women working in blue-collar or service/care occupations and suffering from back/neck pain.

Pain 115 (2005) 273–283 (1)

Figure 3: The Abstract for the RCT used in the hypothetical case-study

Table 1: The ten challenges revealed from the translation process in this hypothetical case-study

#	Challenge	Challenge descriptions
1	Sorting and subsuming into predefined categories	The patients in the studies have often more simple diagnoses than those met in real life. This makes it difficult to use the evidence.
2	Degree of intervention flexibility	The described intervention in the RCTs are too rigid to be adaptable to other persons.
3	Possibility of re-using interventions in new situations	The intervention in the RCT are not described thoroughly, which makes it hard to reproduce
4	Interventions available in the literature	Those interventions used in practice were not those focused on by scientists in the literature
5	Translating average group results to individuals	Difficult to translate mean results to individuals
6	Relevance of the outcome	The interventions from SRs and RCTs were often considered and described as ineffective, while relevant outcomes were not assessed
7	Role of the scientific evidence	The role of the scientific evidence seemed to be different with regard to if it was able to inspire, challenge, enlighten, inform or determine the intervention decision
8	Aim of interventions	The intervention seemed different when the aim was rehabilitation, compared to if the aim was cure or prevention
9	Complexity of interventions	The interventions in the studies were on a continuum from simple to complex, which could challenge the intervention decision in different ways
10	Potential to tailor interventions	The interventions in the studies seemed unequal; some were "good for all interventions", while others were more tailored to each participant in the studies

Note: RCT= randomized controlled trials, SR=systematic reviews

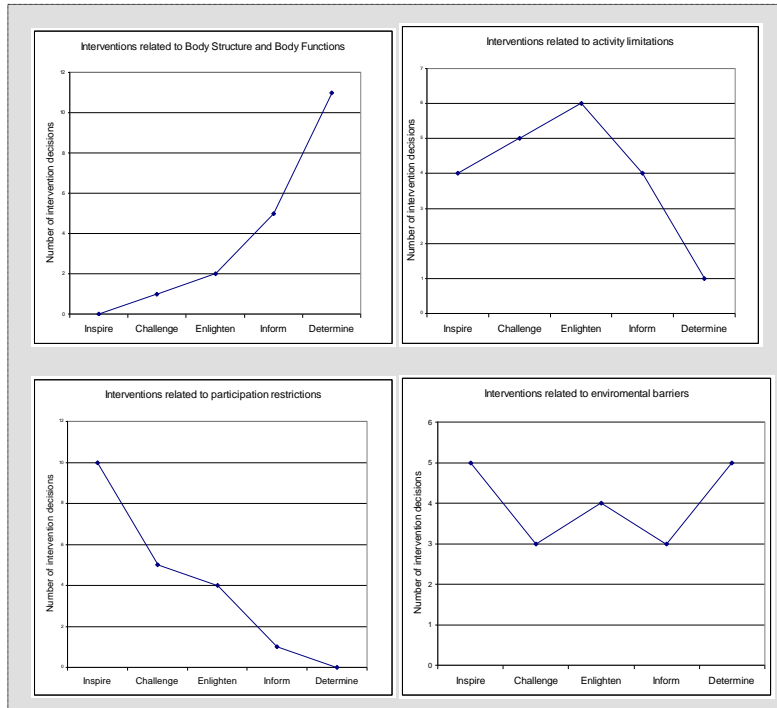


Figure 4: Attempts to visualize a imaginary situation, where 20 intervention decisions were made, targeting each of the components of ICF; for example, when the intervention decisions were aimed at changing the body structures or functions (top left quadrant), such as with surgical/pharmacological interventions, in 11 of the 20 decisions the evidence determined the intervention decision. However, none of the decisions targeting participation determined the intervention decision.

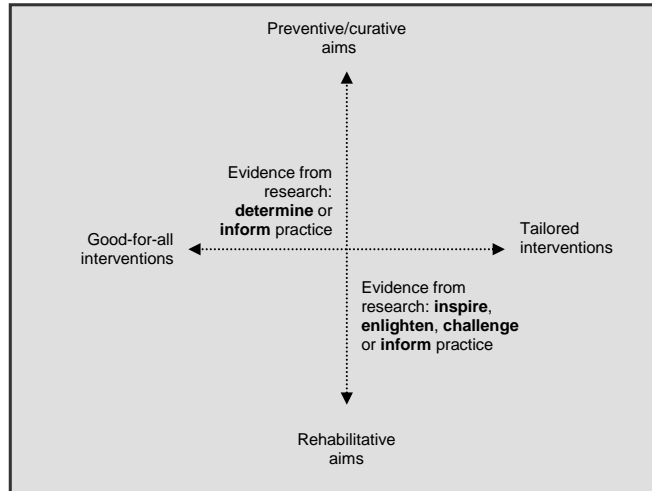


Figure 5: Role of evidence in the translation process when including the aim of the intervention and the tailoring potential of interventions. Intervention decision about good-for-all interventions with preventive aim, might often experience that evidence are determining or informing the decision.

Table 2: Suggestions of ways of handling the challenges revealed in this experiment

#	Challenges	Possible solutions
1	Sorting and subsuming into predefined categories	Allow multilevel interventions which are targeting more than one diagnosis in RTCs and SRs, as this reflects real life in complex practices
2	Degree of intervention flexibility	Promote “frame-type-interventions” with flexible elements that make tailored interventions possible (as SE)
3	Possibility of reusing interventions in new situations	Provide descriptions of intervention programs from RCTs in the Cochrane Library, OTseeker and Pedro
4	Interventions available in the literature	Strengthen collaborative efforts towards practice to increase the adequacy and relevance of interventions that are tested in RCTs
5	Translating average group results to individuals	Provide more information in published RTC-reports on characteristics of who benefited from treatment and those who did not
6	Relevance of the outcome	Develop consensus, based on ICF-terminology, on which outcomes should be used to report effectiveness of interventions
7	Role of the scientific evidence	Apply a wider understanding of the role of each evidence, if it should determine, inform, enlighten, challenge or inspire the decision-making
8	Aim of the interventions	Discuss further if intervention decisions with preventive, curative or rehabilitative aims differ, and provide scientific knowledge about this.
9	Complexity of the interventions	Differentiate between simple and multi-level interventions, as the latter might challenge the translation process the most
10	Potential to tailor interventions	Separate “good-for-all-interventions” and “tailored-interventions” as evidence might be applied differently in these categories

Note: RCT= randomized controlled trials, SR= systematic reviews, SE= supported employment

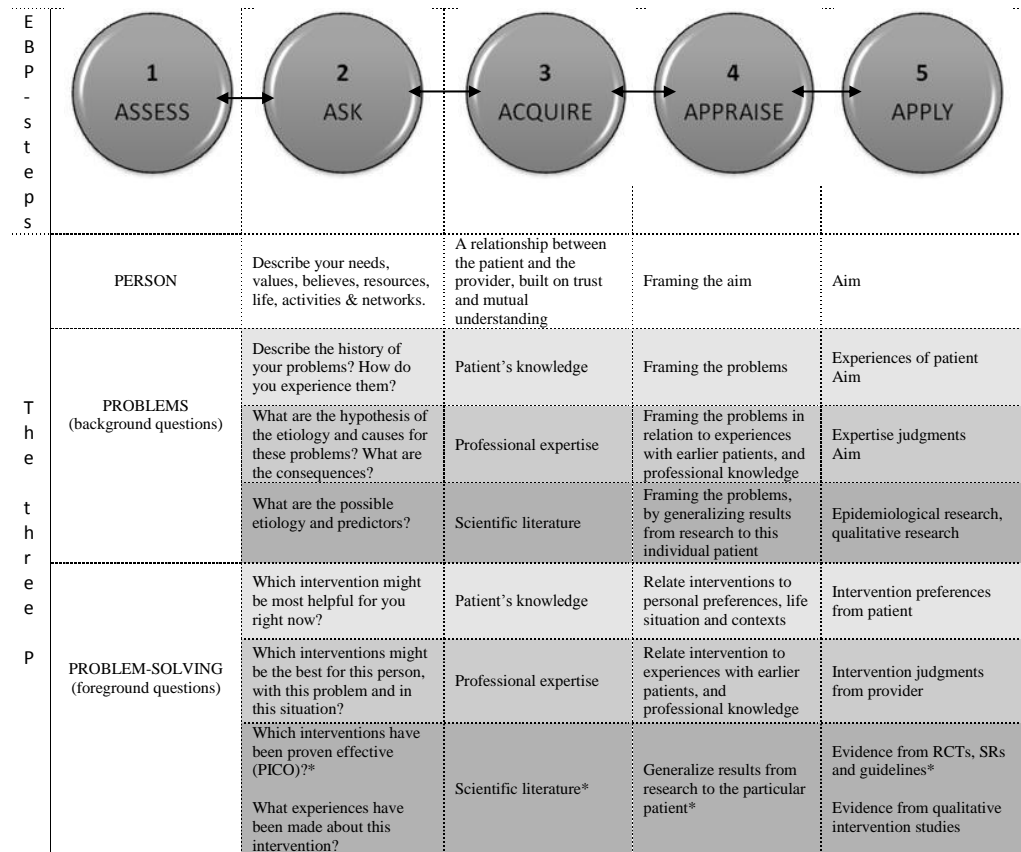


Figure 6: A proposal of revised EBP-steps. Those marked with an asterisk (*) are those usually included in current models of EBP-steps

Appendix 1: Interventions for low-back pain found in the Cochrane Library

<i>Interventions focused divided into types of studies</i>		
<i>Intervention target (ICF)</i>	<i>Cochrane Reviews/Protocols</i>	<i>Single studies: Clinical trials (RCTs and CCTs)</i>
Body structure and body function (incl. psychological functions)	Acupuncture, Antidepressants, Back schools, Behavioural treatment, Botulinum toxin, Chiropractic interventions, Disk replacement (total), Electrical nerve stimulation, Exercise, therapy, Herbal medicine, Injection therapy, Insoles, Laser therapy, Lumbar support, Manual therapy, Massage, Muscle relaxants, Neuroreflexotherapy, Non-steroidal anti-inflammatory drugs, Opioids, Patient education, Prolotherapy injections, Physical examination for lumbar radiculopathy, Radiofrequency denervation, Spinal manipulative therapy, Superficial heat or cold, Traction	Acupuncture, Aerobic training, Anterior discectomy, Anti-inflammatory drugs, ATEAM, Attentional strategi (pain fear), Auriculotherapy, Avinza, Baklosan, Balneotherapy, Biofreeze, Botulinum toxins, Calcitonin, Celecoxib, Chiropractic, Cognitive behavioral treatment, Comprehensive group training, Conservative treatment, Cyclobenzaprine, Depo-Medrol, Dexametopfen, Diclofenack, Dorsal ramus block, Drug therapy, Duloxetine, Dynamic-strength exercise, Education on return to work status(fear avoidance), Electrotherapy, Eperisone hydrochloride, Ergometric training program, Etanercept, Exercise (individual-group), Extensor strengthening program, Feldenkrais therapy, Fluoroscopic caudal injections, Functional restoration, Function-centered rehab, Fusion surgery, Graded exercise, Graded in vivo exposure, Heat therapy, Information booklet on pain persistence, Informative approach, Injection, Integrative medicine, Kuesu point, Laser, Leg lock brace, Lornoxicam, Lumbar fixation, Lumbar fusion, Lumbar support/belt, Lumbar stimulation belt, Magnetotherapy, Massage, Manipulation, Manual therapy, Meditation, McKenzie therapy, Mensendieck exercise, Microcurrent therapy, Mind-body program, Mobilization program, Motivation for self-care, Motor control learning, Movement training, Muscle relaxant, Muscle training, Naprapatic manual therapy, Neuropathic care, Neuroreflexotherapy, Nimesulide, Non-surgical treatment, Opioid therapy, Oscillating blade, Osteopathic manipulation, Oxygen-ozone therapy, Oxymorphone, Ozone therapy, Pain management, Physical strength treatments, Pilates, Piroxicam-beta-cyclodextrin, Pregabalin, Problemsolving training, Psychological intervention, Psychosocial education, Radiofrequency, Radiography, Reflexology, Roprtrotherapy, Sagittal spinal alignment, Sensory discrimination training, Spinal cord stimulation, Spinal manipulation, Spinal nerve root infiltration, Stabilization techniques, Stress management program, Stretching, Steroid injections, Surgery, Sustained-release morphine, Tai Chi, Tapentadol, Thiocolchicoside, Traction technique, Tramadol, Transdermal fentanyl, TENS, TTM-based motivational counseling, Yoga, Valdecocib, Water gymnastics, Wet-cupping
Activity	Bed rest, Manual material handling advice, Physical conditioning programs for improving work outcomes, Staying active	Active treatment, Bed rest, Dual-tasking, Function-centered rehabilitation (vs. pain-centered), Functioning restoration, Graded activity, Lifting instructions, Normal activity, Transfer techniques instructions, participatory ergonomics
Participation		Active sick leave
Environment	Workplace interventions, Assistive devices	Workplace interventions, Worksite visit, Chair interventions, Contextualized educational package
Combinations/ others	Multidisciplinary bio-psycho-social rehabilitation, General interventions for pregnant women with back pain	Problem-solving therapy, Back schools, Behavioral rehabilitation programs, Bio-psycho-social intervention, Classification-based physical therapy, Client centered therapy, Collaboration, Integrated care, Guidelines, Mini-intervention, Modern rehabilitation, Multidisciplinary rehab. Programs, Multistage RTW program, Occupational rehabilitation, Patient education, Physiotherapy, Rehabilitation programs, Therapy based on clinical guidelines, Treatment-based classification system, Innovative work related multidisciplinary program

Note: Search done at the 22nd of July 2010 with the following search strategy; low back pain or back pain in Title, in Cochrane Database of Systematic Reviews and the Cochrane Central Register of Controlled Trials (CENTRAL). Sorted according to the WHO's ICF

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IV

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Randi Wågø Aas^{1,2,3*}, Anders Möller⁴, Patrick Loisel⁵, Kristina Alexanderson²

A governmental initiated sick-leave reduction programme in Norway: Identifying the workplace interventions

¹ PreSenter, International Research Institute of Stavanger, IRIS, Stavanger, Norway

² Division of Insurance Medicine, Department of Clinical Neuroscience, Karolinska Institutet, Stockholm, Sweden

³ PreSenter, Faculty of Health Sciences, Oslo and Akershus University College, Norway

⁴ Nordic School of Public Health, Gothenburg, Sweden

⁵ Division of Occupational and Environmental health, Dalla Lana School of Public Health, University of Toronto, Canada

Abstract

Purpose. This study aimed to identify which workplace interventions twelve municipalities planned or implemented to reduce sick-leave rates. **Methods.** A case-study design with method triangulation was applied. Twelve municipalities with their 20,000 employees from primary health care units, nursing homes, kindergarten, and schools participated. Documents (n=81), and audio-taped focus group interviews (n=12) with each of the local programme groups constituted the material. Qualitative and quantitative content analyses were applied to the data. **Results.** Three-hundred-and-six condensed meaning units about workplace interventions were identified. According to similarity, they were categorised into 15 types of workplace interventions, and separated into two intervention groups due to their target in the organisations: Nine organisational-workplace-interventions (O-WI) targeted structures, processes and culture (n=220 descriptions, 72%), and six employee-workplace-interventions (E-WI) targeted persons/employees (n=86 descriptions, 28%). O-WI involved running a process in the organisation, from assessing to evaluating, but also efforts with developing routines/systems, cooperation/collaboration, information/education, building culture/anchoring, and recruitment/manning. E-WI involved well-being/lifestyle-interventions, physical activity/exercise, redeployment, adaptation, follow-up of sick-listed, and RTW-programmes. The profile of interventions varied considerable between the municipalities, both regarding frequency and content of the interventions. No plausible rationales for this dissimilarity were found. **Conclusions.** The twelve municipalities mainly described workplace interventions targeting organisational systems, processes, and culture aimed at reducing sick-leave rates. There was a large variation in interventions taken.

Key words: Sick leave, Return to work, Disability Management, Workplace interventions, Implementation science

*Correspondence to: Randi Wågø Aas, IRIS, Box 8046, 4068 Stavanger, Norway; randi.aas@iris.no

Introduction

Every year all over the world, a number of small and large intervention programmes are implemented. In Norway, several programmes are initiated by the government offices, or the directorates. Their rationale varies, but also the knowledge they are based on, the context, and how they are facilitated. The PARiHS framework (Promoting Action on Research Implementation in Health Services), see successful implementation of interventions programmes as a function of the interrelation between three key components; evidence, context, and facilitation [18, 26, 20, 14]. Some programmes start with implementing defined and described interventions, built on high quality evidence. Others, like this Norwegian programme to reduce sick-leave rates, starts with a system of facilitation of implementation, and local context engagement in the programme, without having a clear evidence-based approach or clear defined interventions to implement. They are, thereby, built on field experience, common sense, preconceived ideas or political stakes.

This sick-leave reduction programme in Norway was initiated as a result of an intensive public debate on sick leave in 2006. After intervening for reducing the previous high sick-leave rates in Norway within the so-called tripartite Inclusive Working Life Agreement (IA-agreement) [24] since 2001, the national sick-leave rates were again increasing. The government and the employees' organisations disagreed upon who should pay the increasing costs for the higher rates; the employer, the employee, or the government. The government suggested that the employer should pay more than the first 16 days of a sick-leave spell. To try to end this conflict, which the media followed closely, an ad-hoc committee lead by the prime minister of Norway invited the three labour-market parties to suggest other interventions with an equal cost saving effect on the national budget. A list of interventions and programmes was agreed upon, such as faster access to specialists and surgery in hospitals, more occupational rehabilitation

services, and increased use of workplace adaptations.

This committee also identified the sector that had the highest sick-leave rates, namely the public sector, especially the organisations of the municipalities. They had sick-leave rates of 7,7 percent, while the national average rate was 5,8 percent [29], e.g. a 25 percent difference. Self-certificated sick leave was not included in these figures, e.g. which add on average approximately one percent to the sick-leave rates. The prime minister's committee commissioned the municipalities to take actions to reduce those rates, within the realm of the larger, so called "Municipalities-Quality-Programme", which was about to start by then. Thereby, the aim of this particular programme was expanded to cover two goals; to increase the quality of local services towards the inhabitants, and to reduce sick-leave rates among the employees of the 138 municipalities that were to participate. In addition, 12 municipalities were especially picked out to only work with sick-leave reduction. The results from this article are from these 12 organisations. The program started in January 2007, and lasted until August 2010.

In Norway there are 430 municipalities, employing mainly personnel within health care, kindergartens and schools, where 75 percentage of the employee are women. Women in Norway on average had two percentage points higher sick-leave rates than men [30]. More than half of the 450,000 municipal employees worked part time. In Norway, municipalities constitute the lowest public service level, within 19 counties. After the counties, the state is the highest levels. The total number of inhabitants in Norway is 4.9 million. Most of these municipalities are small, in terms of number of inhabitants (min. 220, max. 590,000). The municipals have constantly been a target for restructuring since the 1990'ties.

The indicated solutions for reducing sick-leave rates in this sector were according to this programme non-defined, "bottom-up"-evolved workplace interventions. Thus, the participating

organisations did not get a package of interventions they should implement, for example, according to available evidence. Thereby, this programme was “interventions explorative”, and the rationale for the interventions was to be found at the local workplace arenas. The workplace arena has since the 1990'ties gradually become a core arena for disease and disability prevention [10, 21-23]. This is also evident when exploring articles in Medline, indexed with the Medical Subject Headings Absenteeism and Sick-leave. In 1980, less than 1.0 percent of these articles mentioned workplace or worksite in their titles and abstracts, while that figure for 2006 was 17.6 percent [35]. Workplace interventions and workplace stakeholder involvement are presently seen as crucial in the effort of promoting return to work for employees absent from work [2, 32, 11, 5, 13, 12]. However, they are often tested as packages, and thereby it is difficult to know what combination is really effective. The effectiveness of workplace interventions towards non-sick listed employees is however questioned, and studies are giving negative or inconclusive results for different types of workplace interventions on health outcomes, and sick leave reduction [37, 32, 3].

One hypothesis for such inconclusive results might be that workplace intervention might be seen as a “black box”, and be viewed primarily in terms of its input, output, and transfer characteristics without enough knowledge of its internal workings, that is, its implementation is opaque. This demands “black-box” explorative research. In explorative interventions programmes, like in this Norwegian program, it seems important to identify and describe the content of the workplace interventions. This study, therefore, aimed to identify which workplace interventions the programme participants planned or implemented to reduce sick-leave rates.

Material and methods

Design

A descriptive case-study method [34, 28], with method triangulation were the overall design of this study. The twelve municipalities constituted the cases. To be able to describe and compare interventions for all the cases as a whole, some of the analyses were made at the intervention level. Qualitative and quantitative content analysis [7, 6] were used to identify the workplace interventions and categorize them.

The structure of the sick-leave reduction programme

In line with the Nordic Welfare model, the whole programme was founded on a tripartite cooperation and agreement with the government, employer-, and employee organisations. Three governmental departments were involved; the Ministry of Local Government and Regional Development, the Ministry of Labour, and the Ministry of Health and Care. The programme's supreme agency was the so-called *Political Contact-Meeting*, where all partners were represented. This group were lead by the cabinet minister of the Ministry of Local Government and Regional Development. The next steering level of the programme was the *Administrative Steering Group*, also with a tripartite composition. A secretariat with programme staff was organised. The secretariat supported the participants in the program, which were municipalities. Locally in each participating organisations, a tripartite project group were organised, lead by a project leader. At the local level, stakeholder involvements were required, from employees, employers, union representatives and politicians. Four Research institutions were engaged in this programme, all for a short period of time. They were mainly evaluating interventions and results without further collaboration with the actors and stakeholders than data collection, and occasionally by giving lectures for the local participants. A large number of seminars for the 12 municipalities, and visits from the secretariats were carried through, and the

programme participants were followed closed during the whole programme period.

The twelve programme participants

The twelve municipalities picked out to only work with sick-leave reduction, consisted of a large number of units; primary health care units (e.g. home health care, nursing homes, and rehabilitation units), kindergartens, and schools (e.g. the primary and lower secondary mandatory level, 1-10 grades). These were selected on a non-voluntarily-basis by the government and employer organisation, only to concentrate on reducing their sick-leave rates. Among the 12, they chose two “model-participants”, with long experience of working with sick-leave interventions. The 10 other municipalities were chosen due to having high sick-leave rates. All participating organisations were to organize a project group, with a project leader. These 12 were separated into two network groups of six municipalities, with one “model organisation” in each. The main aim of the networks was to inspire each other in the process of defining and implementing sick-leave workplace interventions. All organisations were obligated to make an intervention plan, and to implement interventions involving a wide range of actors and stakeholder.

Table 1 gives more information about these twelve participants; how many inhabitants they were responsible to give service to (total 256,681), number of employees (total 19,611), employee per inhabitant, and their sick-leave rates during the programme period.

Insert table 1 about here

Data collection and the material

Two types of data were collected; documents (n=81) and focus group interviews (n=12) (table 1). All relevant documents (n=69) that each municipality had developed within their organisation and in their project network, during the first six months of the program, were

collected in the spring 2007. The programme secretariat or the local project groups provided them on request. In 2010, revised versions of the intervention plans were collected. They were also available for the public on the programme’s web-site. These documents included *intervention plans* (mandatory for all twelve), *overall planning documents*, *sick-leave statistics*, *procedures and routines*, *project documents*, *brochures*, *pamphlets*, *power-point presentations*, *memos* from the network seminars, etceteras. The documents contained information on planned and/or implemented interventions, but also some information covering the rationale for the interventions.

The project groups participated at a 30-40 minute group interview. In all interviews, the project leader of the group participated, and in most cases the whole project group of 3-5 persons participated. The project leaders were most often from the Human Resources departments of the municipalities, or were unit managers for nursing homes, home based care, schools, or kindergartens. The interviews were semi structured, based on a interview guide which focused on the participants’ experiences with the different workplace interventions they had planned or provided in the organisation. The interviews were audio-taped and verbatim transcribed to text before analyzed. Two interviews were not recorded due to technical problems. These were instead reported by handwritten report.

Data analysis

Qualitative and quantitative content analyses were applied on the documents and transcripts to reveal meaning units and categories, but also to identify the reporting profile within and between the cases [7, 6, 25, 33, 15]. We defined workplace interventions as “all types of workplace effort, described to be aiming at reducing sick-leave rates, preventing disability, and/or promoting return to work”. The interviews were performed after the first 69 documents were analyzed.

First, every sentence of the text from all documents, except the revised intervention plan, was analysed sentence by sentence to

identify meaning units giving *intervention descriptions* (e.g. planned, ongoing, and implemented interventions). In the same process, we searched for rationale and contextual background for the chosen interventions, as *problem descriptions* (e.g. which problems the organisation experienced in relation to sickness absence), *goal-descriptions* (e.g. which goals the organisations had defined for their interventions), and *criteria for success* (e.g. which factors they experienced as important for achieving the wanted results). Then, the condensed text were re-written as short reports, one for each organisation, and sent to all the programme groups for verification of our results, regarding workplace interventions planned or implemented in their organisation.

The meaning units about intervention descriptions were further coded and categorised on three levels; intervention type, intervention groups, and condensed intervention descriptions, respectively. Later, the intervention plans from 2009 were analysed. To be able to re-contextualise, the interviews and documents were further analysed to find rationales for the different intervention profiles between the twelve cases.

Ethical considerations

The Norwegian Ethical committee for Medical and Health Research region West, has stated that this study is not obligated to be submitted for ethical approval.

Results

The workplace interventions

Two workplace intervention types were identified: *Organisational-Workplace-Interventions* (Organisational-WI) targeting the organisations' structures, cultures and processes, and *Employee-Workplace-Interventions* (Employee-WI) targeting single employee, groups, or all employees in the organisations. These workplace interventions were either provided as ordinary organisational activities or organised as projects. Table 2 gives an overview of these two types of

workplace interventions, their definitions, aims, and intervention sub-groups.

Insert table 2 about here

As seen in the appendix, *Organisational-WI* (O-WI) were rich described, and constituted four process-O-WI and five structural/cultural-O-WI. *Performing self-assessments* involved a wide range of assessments targets on organisational, group, or individual levels. *Setting goals* involved indirect goal setting regarding efforts in the organisation to decrease sick-leave rates, or direct goal setting concerning the sick-leave problem itself. *Planning* for reducing sick-leave rates were described through two main channels; planning documents and planning meetings, respectively. Such planning was executed through systematic approaches with long-term perspectives. *Evaluation* was most often performed to develop strong data and provide statistics enabling continuous attention of the sick-leave situation. The importance of communicating results from the evaluations, and ways of doing this, to the units and departments were described. *Developing routines and systems* were connected to the general Health, Safety and Environment (HSE) processes in the organisation, including deviation-control from HSE-procedures, and systems for reporting and revision. The most frequent routines were follow-up routines of sick-listed employees. In Norway, this routine is regulated by law and mandatory, but still their content and implementation varied to a large extend in these twelve municipalities. The informants further emphasized *cooperation and collaboration* as crucial, involving actions and systems for securing cooperation between stakeholders and actors in the return to work process. Described standards were nearness, earliness, goal-oriented processes, and defined roles. *Information and education* was to be done on a regular basis. Rich descriptions on how, what, where, and towards whom these interventions should be directed were identified. Another important area was *Building culture and anchoring*. These efforts involved four important aspects: securing involvement, ownership, attitudes, and increase awareness of

the causes of high sick-leave rates. *Recruitments and manning* involved how to organize recruitment of people with disabilities, and how to adapt a work environment that made it possible to retain work.

Employee-WI (E-WI) constituted six different interventions; two primary preventive E-WI and four secondary preventive E-WI. *Well-being and lifestyle interventions* contained a spectrum of different interventions targeted at social, nutrition, smoking, or welfare aspects. *Facilitating physical activity and exercise* involved several types of exercise offers. *Redeployment* involved providing alternative jobs or tasks. *Work adaptation* included just a few descriptions on how to adopt the physical environment or the working hours. *Following-up sickness absentees* included dialog meetings and follow-up plans, both to be executed as early as possible in the sick-leave trajectory. Risk groups, as long-term sick listed, pregnant employees, and employees with mental disorders were to be offered extra follow-up. *Rehabilitation/RTW-programmes* were targeting sick-listed and disabled with musculoskeletal disorders.

Reporting profiles

Figure 1 and table 3 presents the result of the reporting profiles of the 12 organisations. Altogether, 306 condensed meaning units of intervention descriptions were identified in the material; 220 Organisational-WI (72%), and 86 Employee-WI (28%). The three most frequent intervention groups *Information and education*, *Developing routines and systems* and *Cooperation and collaboration* together made up 40 percent of all, and 55 percent of the Organisational-WI. *Physical activity and exercise* together with *Promoting well-being and lifestyle interventions* constituted more than 50 percent of all intervention descriptions within the E-WI-group.

Insert figure 1 and table 3 about here

As seen in figure 2, the twelve municipalities' intervention profiles varied much, in how many workplace intervention descriptions they gave (mean: 26, SD: 14, min. 14 - max. 51), but also

in which type of intervention they planned or had implemented. All but one organisation had more intervention descriptions of Organisational-WI than of Employee-WI.

Insert figure 2 about here

The rationale for choosing interventions

In the next step the documents and the interview transcripts were further analysed to re-contextualise the interventions and search for rationale for why the organisation's intervention profiles had become so different. Some possible plausible explanations' were found in the documents, as differences in; economic situation, employee age-mix, inhabitants age-mix, rapid growth of inhabitants, recruitment situation, HSE-challenges, leadership challenges, violence/threats, sick-leave rates, and distribution of short- versus long-term sick leave. Still, these *internal and external differences* could not explain all the variation revealed. The rationale that became most obvious when analysing the interviews, were the large differences between the organisations competence regarding inclusive working life and disability management's ideology, goals, efforts, self-insight, consciousness, anchoring of the sick-leave problem from top to bottom, proactive skills, and attitude towards sickness absence and disability.

Discussion

Substantial discussion

By these twelve municipalities' attempts to reduce sick-leave rates, more than 300 intervention descriptions of employer-provided workplace interventions were identified. This study therefore provided a terminology of bottom-up empirical employer-provided workplace interventions to reduce sick-leave rates, which cover more of the variety that this complex intervention represent in real contexts than earlier known.

Below, the following three main findings will be discussed; (1) two types of workplace interventions where identified; e.g.

organisational-WI, and employee-WI, (2) organisational-WI was the most richly described intervention type, compared to Employee-WI, as adaptations and return to work-programmes, which were seldom and sparsely described, and, (3) there were a huge difference between the intervention profiles for each municipality.

In this study we identified two types of workplace interventions, organisational-WI and employee-WI. On a higher order level, this is in line with Karasek's dichotomy of workplace interventions aiming at stress prevention [17]. He called these organisational-level interventions targeting the psychosocial environment, and individual-level interventions, that focused on how individuals behave and cope with that environment [17]. Still, on lower order levels, the content and target of these interventions are different than those identified in this study. Organisational-level workplace interventions towards stress reduction were described as *selection and placement, training and education programs, physical and environmental characteristics, communication, job redesign, and restructuring/reorganisation, and employee control* [9, 8, 17, 16], respectively, while individual-level interventions were *relaxation, exercise, cognitive therapy, meditation, time management, biofeedback, and employee assistance* [9, 8, 17, 16]. The most equal second-level interventions seem to be communication, job redesign, and exercise. Egan and colleagues [8] reviewed the literature to find how stress reduction organisational-level workplace interventions, aimed to gain health effects, were implemented. They found the following four types of workplace interventions in 103 studies; *employee participation, changing job tasks, shift changes, and compressing working weeks*. None of these were richly described in our data.

In these 12 cases, organisational-WI was the most emphasized and described workplace intervention type. Seven of ten of the descriptions (meaning units) were about this type of interventions, and ten out of twelve organisations had mostly organisational-WI,

where *Information & education and cooperation & collaboration, and developing routines & systems* dominated. This might be due to that the interventions were mainly designed by HR and administrative personnel, more familiar with organisational policies than with dealing with individual problems. Organisational-WI was described as interventions that needed a continuous focus over time to show effectiveness. A willingness to earmark the needed resources for this sick-leave reduction work might thereby demand dedicated and goal-oriented management, but also relevant leadership qualities towards sickness absentees [36], to facilitate successful implementation [20].

Organisational-WI might be seen as a prerequisite for employee-WI. For example; when having an organisation with high competence on disability management, well developed follow-up routines, structures for meetings, and cooperation towards social insurance and general practitioners, they might be well prepared for employee-WI, as follow-up of the single employees' return-to-work process. Reviews have revealed that cooperation between health care and workplace actors concerning RTW is important to promote return to work for those absent from work [12, 5].

Opposite, employee-WI were seldom mentioned and sparsely described, except for the intervention type *Physical activity and exercise*. This type of intervention has been proven ineffective on work retention or RTW by several studies, for example for workers with acute back pain [27]. Conversely, recent interventions proven effective are not used in this programme. For example, employee-WI such as *adaptations* was almost not described at all, and only by five of the organisations. This type of intervention is often seen as a core intervention for making working possible in spite of disability and disorders [1, 23]. Anema and colleagues found 60 different types of workplace adaptations in use in a programme in the Netherlands [1]. *Return to work programmes* were in a similar manners mentioned by only two organisations. Well

designed RTW-programmes have been proven effective for reducing sick leave [13, 12, 32]. None of these were described in this programme. This might be due to that the programme group did not know about these evidences.

The interventions concerning the follow-up of sick-listed employees were not that limited described, when counting meaning-units. This type of intervention was, however, about the formal and more technical part of the follow-up, as using the routines, having dialog-meetings, making follow-up-plans and conversation, not about the content, competence, and components of interventions in the return to work-process. One feasible reason for this lack of emphasis and descriptions might be that the RTW-programmes and adaptation were supported by others, the OHS, the GPs, other health care workers, or the social insurance office. Still, this would be visible in all these documents and interviews, for example, as a description of a workplace visit for all employees sickness absent for more than 4 weeks, which is proven effective on return to work [12].

The third finding was that there were large differences between each organisation in the amount and profile of intervention descriptions, even though they approximately had the same number of documents. It is striking that this joint network, supposedly, at the beginning leads to such variation in interventions design and in implementation. The variations were of two types; variation in the number of intervention descriptions, and variation in which type of interventions they implemented. While five organisations had 14-17 descriptions, three other organisations had 44-50 intervention descriptions each. This can undoubtedly be random. One explanation could be that intervention descriptions were more detailed for those with many interventions. However, the data does not support this explanation. Even though the meaning units are unequal in how well they are described, a systematic difference between the organisations was not possible to reveal. Another explanation could be that they have different amount of

intervention descriptions due to different needs and possibilities in the organisations. For example, could small organisations need fewer interventions, or did they not have the same resources for intervention developments as the large organisations did? Neither such patterns were found in the data.

The profile of combinations of interventions also to a large extent differed between the organisations. This study revealed that most of the organisations had no intervention descriptions regarding several of the interventions. Some were especially solid on one intervention, as “organisation I” that had half of their intervention descriptions on *physical activity and exercise*. The balance between Organisational-WI and Employee-WI also varied. Some of the municipalities almost had none described Employee-WI, even though they described a wide range of Organisational-WI. While for one municipality the descriptions to 95 percent were about Organisational-WI, they were 35 percent of all they described for another. This might be because they were not aware of this imbalance, as they lacked the overview which comes with the intervention terminology from this study. This intervention praxis might be described as “to grope in the dark”. Up until now, there is no scientific evidence regarding which combinations of organisational-WI versus employee-WI that is the most effective to reduce sick-leave rates. Also, more knowledge about which type of combination between employee-WI and clinical interventions that is most effective, is needed [37, 35, 32].

Methodologically limitations

The aim of case studies is to provide knowledge about qualities of the phenomenon under study, and to raise hypothesis that later can be tested in representative studies. Statistical generalization is not desired or possible, as the sample is not representative. Still, theoretical generalization is suitable and of interest. Counting meaning units is usual in content analysis, just to be able to raise hypothesis of possible connections and patterns, which need to be further explored by

use of larger scaled representative surveys [7, 6]. This results needs, however, to be explored and replicated in other cultures, sectors, and trades. Still, new studies might not give diverse results on the highest levels of the terminology developed in this study; level 1, *intervention types* (ex. Organisational-WI, Employee-WI), or level 2, *intervention groups* (ex. Information and education, Adaptations). Theoretical generalization on these levels might be possible. However, new studies will probably contribute to more diversity on the lowest level, level 3, *intervention descriptions*. Another limitation in this study might be that 12 organisations might be too few to get the variation that exists between organisations. This might reduce the external validity.

All twelve participating organisations were to develop an intervention plan, describing all their planned and ongoing sick-leave intervention. This intervention plan was presented to all in their network, which could stimulate to describe all their workplace interventions. They all also got the possibility to correct the intervention plan, after the analysis from the researchers and confirmed the content of the analysed intervention plan.

Another possible limitation in this study is if the documents and interviews really did report all interventions they planned or implemented. Additionally, the degree of reporting is also a problem with this type of data. Some interventions were reported on a broad level, as headlines, while other interventions were described in detail. This is mostly a problem on a detailed level, which then sometimes lack details in their descriptions. This is also a problem when we quantified meaning units. Still, in this data material, this inequality seems to be spread between the different type of interventions and between the organisations, and thereby it was not a systematic disalignment.

Two interviews were not taped and transcribed, and the analyses of them were done on written memos. This might reduce the detailing level of the descriptions from the focus group participants in these two focus group meetings.

In this study, the researchers were not involved in selection of cases. Three governmental departments and the employer organisation selected them. As heterogenic inclusion strategies were chosen, this are not regarded as a potential bias in this type of research. The sample is not recognized and presented as a representative sample.

Implication for practice and further research

To know organisational-WI more in depth might be important for workplace actors, social insurance actors, GPs, occupational physicians, and other OHS-personnel. This terminology could also be used to build instruments, assessing the associations between the company's intervention profile and sick-leave rates. This, however, demands more explorative research to replicate and expand the findings. Up till now, there is a lack of rigorous experimental research assessing the effectiveness of organisational-WI. The insight in the complexity of these types of interventions might make this easier.

To be able to secure better programme implementation in the future, it is also crucial to more often link implementation science to implementation practice. According to the PARiSH framework [18, 26, 20, 19], this programme seems to have lost one of the three components important for successful implementation. The evidences documenting which workplace interventions the municipalities should implement were not clearly present in this programme. Neither were a researcher as a collaborator and implementation facilitator. Implementing workplace interventions in an evidence-based way demands continuous dialog and collaboration with researchers during the whole process. The researcher's role would be to provide relevant evidence, to discuss the knowledge base for choosing interventions, and to help designing and evaluating evidence-based workplace intervention implementations. Social interactions, dual dialog by use of audit and feedback, has been showed to be effective to increase the evidence uptake in practice [31,

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4]. Evaluations of complex interventions should also include more detailed planning and reporting of the implementation itself, and consider how to measure quality of implementation process [8].

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Tables and figures

Table 1: Characteristics of the twelve organisations participating in the programme

Characteristics of the 12 organisations									Data collection	
Org. Id.	Inhabitants	Employees	ER	Sick-leave rates					Doc.	Interviews
(A-L)	(N)	(N)		05/06	06/07	07/08	08/09	09/10	(N)	(N)
A	72 760	5652	13	11.8	11.6	11.8	12.1	10.8	7.0	1
B	22 937	2017	14	10.1	10.0		10.3	8.8	7.0	1
C	26 104	2085	13		11.5	11.3	12.2	9.9	5.0	1
D	14 543	983	15	6.9	7.3	6.6	7.7	7.3	6.0	1
E	17 129	1094	16	10.4	10.1			9.4	6.0	1
F	12 313	1113	11	13.9	12.9	11.9	12.1	10.9	6.0	1
G	6 451	721	9	11.3	10.3	11.6	11.1	10.7	7.0	1
H	20 600	1452	14	8.7	9.3	8.8	9.1	8.4	6.0	1
I	28 645	2360	12	9.6	8.1	9.8	9.4		9.0	1
J	2 951	334	9	11.4	10.4	8.9	10.3	8.8	6.0	1
K	28 138	1644	17	10.1	10.9	10.8	10.7	9.5	8.0	1
L	4 110	484	8	11.9	10.7	9.3	11.2	9.8	6.0	1
Total	256 681	19 939	13						79.0	12
Mean	21 390	1662	13	9.7	10.3	8.4	9.7	8.7	5.8	1

Notes: Number of inhabitants refer to the number of inhabitants in each municipality, that is, the numbers the public organisations are to provide services for. ER= employment rate, e.g. the number of inhabitants for each employee. Doc = documents

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Table 2 Two main types of workplace interventions identified in the analysis

	ORGANISATIONAL-WORKPLACE INTERVENTIONS	EMPLOYEE-WORKPLACE INTERVENTIONS
<i>Abbreviations</i>	Organisational-WI or O-WI	Employee-WI or E-WI
<i>Definition</i>	O-WI are planned actions within an organisation to prevent sick-leave and disability and promote a fast return to work, by targeting organisational structures, processes and culture. O-WI are divided into two subgroups; process-O-WI and structural/cultural-O-WI.	E-WI are planned actions within an organisation with an aim to prevent sick-leave and disability and promote a fast return to work, by targeting the persons in the organisation. Employee-WI are divided into two subgroups; primary prevention-E-WI and secondary prevention-E-WI(RTW-E-WI).
<i>Aim</i>	Prevent sick-leave and disability to occur Promote a fast and sustainable return to work	Prevent sick-leave and disability to occur Promote a fast and sustainable return to work
<i>Main target</i>	Organisational structures Organisational processes Organisational culture	All employees Groups of employees Single employees
<i>Provision of the interventions</i>	Primarily provided as ordinary organisational activities, and just occasionally organised as projects, then targeting problem areas (as work force management and collaboration and cooperation between stakeholders)	Most often provided as ordinary organisational activities, but sometimes organised as projects targeting prioritized groups or problem groups (as those with high sick-leave rates; e.g. cleaners, pregnant employees)
<i>Intervention sub-groups</i>	<p>Process-O-WI</p> <ol style="list-style-type: none"> 1. Performing self assessments 2. Setting goals 3. Planning 4. Evaluating <p>Structural/Cultural-O-WI</p> <ol style="list-style-type: none"> 5. Developing routine & systems 6. Cooperation & collaboration 7. Information & education 8. Building culture & anchoring 9. Recruitment & manning 	<p>Primary prevention-E-WI</p> <ol style="list-style-type: none"> 1. Well-being and healthy lifestyle 2. Facilitating physical activity and exercise <p>Secondary prevention-E-WI</p> <ol style="list-style-type: none"> 3. Redeployment 4. Adaptation 5. Follow-up sick-listed 6. Rehabilitation/RTW-programmes
<i>Interconnection between O-WI and E-WI</i>	Organisational-WI were revealed as a fundament for the Employee-WI in the organisation.	Employee-WI were highly dependent on Organisational-WI, as when working with sick listed employees, the routines, cooperation systems, and competence will highly influence the outcome.

Notes: O-WI=Organisational-Workplace-Interventions, E-WI=Employee-Workplace-Interventions, RTW= Return to work

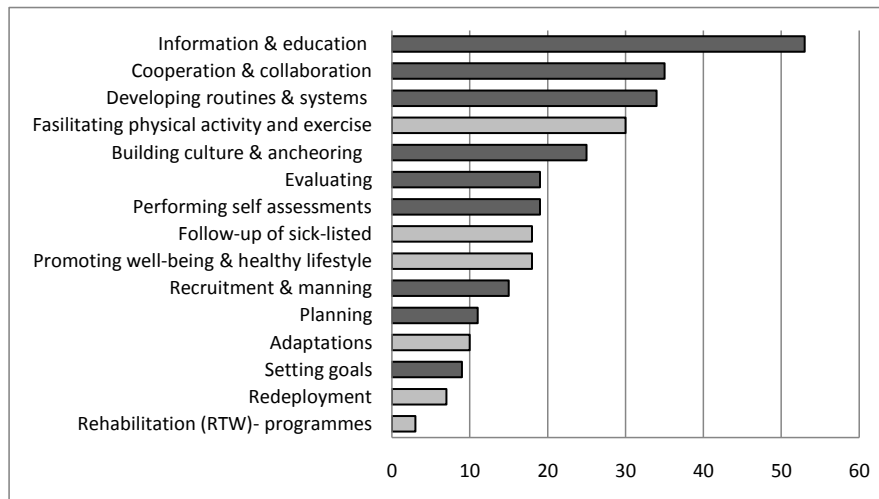


Figure 1: Number of workplace intervention descriptions resulting in 15 different types of workplace intervention. The light are employee-WI and the dark are organisational-WI

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Table 3 Workplace intervention profiles and types of workplace interventions in the 12 studied organisations

Workplace intervention types		12 organisations (A-L)													
		A	B	C	D	E	F	G	H	I	J	K	L	Tot.	
Organisational-WI	Performing self assessments	3	1	1	4	1	1	2		5		1		19	
	Setting goals	5	1		1					1	1			9	
	Planning	2	3	2			2			2				11	
	Evaluating	2	2		3	1	4	1	2		2		2	19	
	Developing routines & systems	7	1	6	4	5	1		5	2	1	1	1	34	
	Cooperation & collaboration	6	2	3	9	3	1	4	1	1	1	2	2	35	
	Information & education	12	1	5	6	7	3	3	1	8	1	3	3	53	
	Building culture & anchoring	1	2		3	1	2	2	2	5	3		4	25	
	Recruitment & manning	1		1	3		3		2	1	1	2	1	15	
	Total (N)	39	13	18	33	18	17	12	13	25	10	9	13	220	
Total (%)	76	93	82	70	95	71	86	76	57	71	38	81	72		
Employee-WI	Well-being & healthy lifestyle	3		1	4		2	1		2	1	3	1	18	
	Facilitating physical activity and exercise	4		1	1		5			12	1	5	1	30	
	Redeployment	1		1	2	1						2		7	
	Adaptation	1			2				3	3		1		10	
	Follow-up sick-listed	3	1		4			1	1	2	2	3	1	18	
	Rehabilitation (RTW)- programmes			1	1							1		3	
	Total (N)	12	1	4	14	1	7	2	4	19	4	15	3	86	
	Total (%)	24	7	18	30	5	29	14	24	43	29	63	19	28	
Total (N)		51	14	22	47	19	24	14	17	44	14	24	16	306	

Notes: The numbers refer to meaning units describing a workplace intervention. WI= workplace intervention. RTW= return to work

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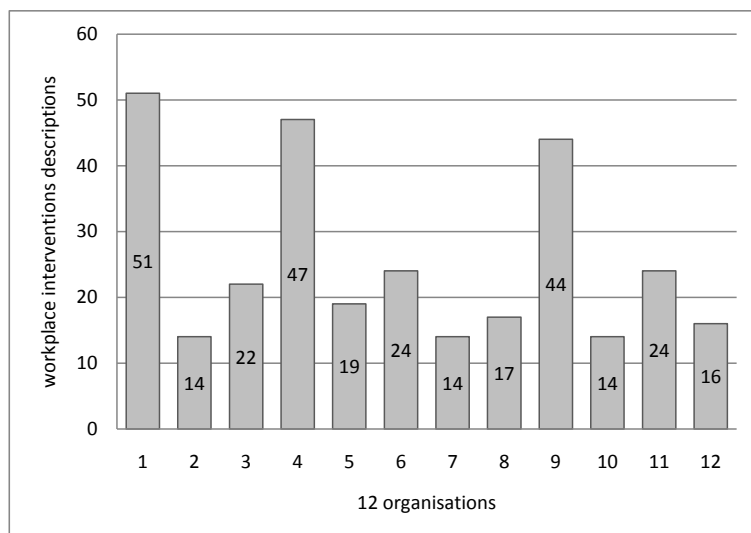


Figure 2: Number of workplace intervention descriptions for each of the 12 municipalities

Appendix: Overview of the condensed results about workplace interventions, planned or implemented by the twelve organisations

Organisational Workplace Interventions	Process Organisational-WI	Performing self assessment	<i>Assessing persons:</i> Generic employee assessments, assessments of health, cooperation, groups with high sick-leave rates, number on long term sick-leave and disability pension, general surveillance of sick-leave rates, counting executed dialog meetings, identifying causes for high sick-leave rates, and identifying potential targets for sick-leave reduction. <i>Assessing the organisation:</i> Assessing organisational patterns, causes for sick-leave rates, and potential targets for reduction of sick-leave rates. <i>Assessing the environment:</i> Psychosocial environment, noise level, indoor climate assessments, and identifying improvement possibilities for workplace adaptations, causes for sick-leave rates, and potential targets for reduction of sick-leave rates, recording of substances, and industrial medicine inspections
		Setting goals	<i>Goal targets:</i> Setting goals for the sick-leave situation, but also the sick-leave efforts. Integrate the sick-leave goals in the HSE-goals for the organisation. <i>Goal setting process:</i> Involve supervisors and employees in goal setting on department level. Using systems to increase the quality of the goal setting processes. <i>Demands for goal setting:</i> Setting goals that are measurable and possible to control. Get faster information about the status to increase timely goal-setting. Identify goals and incitements for reducing early retirement. <i>Aim of goals:</i> Identifying goals for a better the use of social insurance offices competence and interventions, and for preventing disabled to quit job.
		Planning	<i>The planning process:</i> Working with plans systematically, but also on long term. <i>Content of planning & plans:</i> Planning and plans for life-long employer policy, education of supervisors, personnel safety employees representative, and union representatives. Planning progress of interventions, and inclusive working life. Planning priorities between different interventions. <i>Planning meetings:</i> Meetings to identify interventions at each department. Identify factors to increase presenteeism (also external meeting participants)
		Evaluating	<i>Evaluating tools:</i> Using pc-tools to evaluate leadership, employees job satisfaction and working environments. Using appraisal interviews for evaluation. Reporting sick-leave rates with color codes, - green, yellow and red. Evaluating meetings with the politicians, leadership, and unions. <i>Data quality and communication:</i> Increase the quality of the statistical data, how to analyse them, how to present statistics, and how to make use of statistics. Secure comparable statistics over years. Visualize the best results. <i>Evaluating effectiveness, consequences and costs:</i> Evaluate effectiveness and efficacy of interventions. Providing detailed statistics for the departments every month. Include information about sickness absences consequences and costs. <i>Others:</i> Debriefing after crises. Evaluation of supervisors. Follow-up of employees-surveys.
	Structural Organisational WI	Developing routines & systems	<i>General development and administration of routines:</i> Development of routines within the HSE-area, including deviation systems, reporting systems, and revision of those. The routines needs clear distribution of responsibility, defined tasks, be up-to-date, and communicated regularly on supervisory level in the organisation. <i>Follow-up system for RTW:</i> Developing step by step routines for the follow-up of sick listed, which starts before sick leave happens. Needs to be an overall but detailed system, which includes useful templates, intervention check-lists, and clarified demands towards the employee. Are to be known in the organisation, and regularly on the agenda of the occupational environment committee, but also through the performance appraisal interviews. <i>Social, organisational and attitudinal environment:</i> Routines for regular assessments of organisational and psychosocial environment, intervention focused approach, co-worker-ship and conflict negotiations. <i>Others:</i> Developing routines for special groups as seniors, and pregnant employees, for special areas/topics as reduced used of part-time, interaction between employee and supervisor, top management involvement and cooperation towards social insurance office.
		Cooperation & collaboration	<i>Towards GPs:</i> Involve the GP early in the relation between the sick listed and supervisor, especially in the dialog meetings. Define the role of the GP in relation to the company. Involve the GPs in the relation between the workplace and social security office, through a cooperation council. <i>Towards OHS:</i> Secure cooperation, support, and goal-oriented use of the OHS. Use the OHS in relation to contact with the social insurance office. <i>Towards social insurance office:</i> Cooperate close and goal-oriented with the social security office, and secure support on the following issues; companies' sick leave rates, new legislation, education, exercise positions, economic interventions, sick leave self-certification routines, follow-up and early clarification of sick listed. <i>Towards others:</i> Secure cooperation, follow up, and establish network between private and public companies, supervisors in the company, employee representative and the personnel safety representative, and working environment committee. Secure a clear distribution of work. Organise a committee for the management of the sick leave cases in the organisation.

Employee-Workplace - Interventions		Information & education	<i>Where:</i> In meetings, by use of brochures/phamplets, though media, company newspapers. <i>How:</i> A spectrum of different types of information and education activities as courses, conferences, practical implementation of new methods at workplaces, information visits to all units every year or different types of leadership developments, buddy systems, transfer-education system aso. <i>About:</i> Training in different topics as HSE-efforts, conflict guidance, setting limits, transfer of patients, leadership, how to talk with sick listed, ergonomics, attitudes, roles and tasks for different actors, follow-up of sick listed (especially those with mental disorders), rights and duties for sick listed, inspire old workers to remain in work aso. <i>Who:</i> All levels, employees, supervisors, personell safety deputy, employees representative, politics, board members, long term sick listed, seniors aso.
		Building culture & anchoring	<i>Secure involvement and ownership:</i> Create involvement and thereby ownership, and anchorage among the employees, supervisors, personell safety representative, employee representative, and politicians. This could be achieved by letting the majority participate in defining goals and actions for reducing the sick leave rates, by giving clear expectations to all, by founding efforts on the employee survey, and by define agreements where the supervisors are made responsible. <i>Create attitudes and make conscious:</i> Make employees, employees representatives and supervisors conscious of the causes for sick leave. Treat employees serious, and promote fellowship. Make everyone work together as a team. Use enthusiasts actively, and arrange seminars for those to gain the wanted attitudes. Introduce the topic of presentism in different fora. Implement the culture in the routines. Strengthen the reputation by spreading success stories internally, and in the media. Create motivation and joy of succeeding.
		Recruitment & work force management	<i>Disabled:</i> Establish a committee which will be responsible for recruiting persons with disabilities. Give possibilities for work training. <i>Seniors:</i> Give possibilities for shorter days and longer holidays for seniors. Define and implement senior-politics as IT-courses, social meetings with information on topics as retirement pension aso. <i>Others:</i> Secure and keep work force management by use of job rotation, reduction of positions, increase leadership spreading, smaller working units and good substitute arrangements. Give more resources to supervisors, which make it possible to work with sick leave efforts.
	Primary preventive E-WI	Well-being & lifestyle interventions	<i>Culture activities:</i> Concerts, theatre, internal choir, revue, humor seminars. <i>Social activities:</i> Excursions, parties, "secret buddy/mate". <i>Nurtirion , health and welfare:</i> Canteen/staff restaurant, massage chair, quit smoking courses, disinfection routines for hygienics
		Facilitating physical activity and exercise	<i>Exercise equipment:</i> Indoor exercise facility, pool, gymnasium, wardrobe, access to fitness studio, bicycles for employees, waking sticks. <i>Exercise organisation:</i> Company sports team, educating internal exercise, and health counsellors. <i>Exercise offer:</i> Dancing courses, mini-exercises/pause exercises offered in the working units, swimming groups/pool exercise, bicycle to work campaigns, walking sticks groups, aerobic, exercise videos, bicycle tours, individual counselling, volleyball, bowling, skating, health day for employees. <i>Economical offers:</i> Exercise during working hours, subsidy from social insurance office for exercise equipment, free exercise for employees and sick-listed at fitness studios
	RTW-EWI (secondary preventive E-WI)	Redeployment	<i>Organisation of the intevention:</i> Organise redeployment committee which meet regularly. Appoint a project group that will elucidate needs for redeployment. Organise temporary jobs that will be on top of ordinary staff. Organise a test office for assessing if office work is possible to do.
		Adaptation	<i>What:</i> Ergonomic adaptation of office work, assisting devises, working hours adjustments (reduced, moved, pauses). <i>Who:</i> Adaptation for special groups, seniors, pregnant, sick-leave risk groups. <i>How:</i> Adaption needs to be continuous
		Follow-up sick listed	<i>Using the routines:</i> Use of well deveoped and written routines for the follow-up of sick-listed workers. <i>Content:</i> Conversation with the sick-listed and early dialog meetings, which also should adress the follow-up process. Generate the follow-up plan as early as possible. Secure extra follow-up of long term sick-listed, pregnant employees and employees with mental problems.
		Rehab/RTW-programmes	<i>Various:</i> Abroad "rehabilitation stay" for sick-listed. On site holistic rehabilitaion programme for sick-listed with musculoskeletal disorders. Programme for inclusion of disabled

Note: HSE= Health, Safety and Environment, RTW=Return to Work. GP= General Practitioner. OHS= Occupational Health Services.

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Appendix (V)

Workplace interventions for neck pain in workers (Review)

Aas RW, Tuntland H, Holte KA, Røe C, Lund T, Marklund S, Moller A



This is a reprint of a Cochrane review, prepared and maintained by The Cochrane Collaboration and published in *The Cochrane Library* 2011, Issue 4

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Workplace interventions for neck pain in workers (Review)
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[Intervention Review]

Workplace interventions for neck pain in workers

Randi Wågø Aas¹, Hanne Tuntland², Kari Anne Holte¹, Cecilie Røe³, Thomas Lund¹, Staffan Marklund⁴, Anders Møller⁵

¹International Research Institute of Stavanger (IRIS), Stavanger, Norway. ²Faculty of Health and Social Sciences, Bergen University College, Bergen, Norway. ³Physical Medicine and Rehabilitation, Oslo University Hospital Ullevål, Oslo, Norway. ⁴Department of Clinical Neuroscience and Division of Insurance Medicine, Karolinska Institutet, Stockholm, Sweden. ⁵Nordic School of Public Health, Gothenburg, Sweden

Contact address: Randi Wågø Aas, International Research Institute of Stavanger (IRIS), Box 8046, Stavanger, 4068, Norway. randi.aas@iris.no.

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ABSTRACT

Background

Musculoskeletal disorders are the most common cause of disability in many industrial countries. Recurrent and chronic pain accounts for a substantial portion of workers' absenteeism. Neck pain seems to be more prominent in the general population than previously known.

Objectives

To determine the effectiveness of workplace interventions (WIs) in adult workers with neck pain.

Search strategy

We searched: CENTRAL (*The Cochrane Library* 2009, issue 3), and MEDLINE, EMBASE, CINAHL, PsycINFO, ISI Web of Science, OTseeker, PEDro to July 2009, with no language limitations; screened reference lists; and contacted experts in the field.

Selection criteria

We included randomised controlled trials (RCT), in which at least 50% of the participants had neck pain at baseline and received interventions conducted at the workplace.

Data collection and analysis

Two review authors independently extracted data and assessed risk of bias. Authors were contacted for missing information. Since the interventions varied to a large extent, International Classification of Functioning, Disability and Health (ICF) terminology was used to classify the intervention components. This heterogeneity restricted pooling of data to only one meta-analysis of two studies.

Main results

We identified 1995 references and included 10 RCTs (2745 workers). Two studies were assessed with low risk of bias. Most trials (N = 8) examined office workers. Few workers were sick-listed. Thus, WIs were seldom designed to improve return-to-work. Overall, there was low quality evidence that showed no significant differences between WIs and no intervention for pain prevalence or severity. If present, significant results in favour of WIs were not sustained across follow-up times. There was moderate quality evidence (1 study, 415 workers) that a four-component WI was significantly more effective in reducing sick leave in the intermediate-term (OR 0.56,

Workplace interventions for neck pain in workers (Review)

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95% CI 0.33 to 0.95), but not in the short- (OR 0.83, 95% CI 0.52 to 1.34) or long-term (OR 1.28, 95% CI 0.73 to 2.26). These findings might be because only a small proportion of the workers were sick-listed.

Authors' conclusions

Overall, this review found low quality evidence that neither supported nor refuted the benefits of any specific WI for pain relief and moderate quality evidence that a multiple-component intervention reduced sickness absence in the intermediate-term, which was not sustained over time. Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate. There is an urgent need for high quality RCTs with well designed WIs.

PLAIN LANGUAGE SUMMARY

Workplace interventions for workers with neck pain

Studies have shown that musculoskeletal disorders are the most common cause of sick-leave and disability in many industrial countries. Neck pain is more common in the general population than previously known. This Cochrane review presents what we know from research about the effect of workplace interventions for workers with neck pain who, for the most part, are not sick-listed.

Ten trials with 2745 participants were included in this review. Two studies were rated as having low risk of bias. The workplace interventions comprised education about stress management, principles of ergonomics, anatomy, musculoskeletal disorders, and the importance of physical activity. They taught 'pause gymnastics', how to use a relaxed work posture, proper positioning, the importance of rest breaks, and strategies to improve relaxation. Some studies also included how to modify work tasks, work load, working techniques, working positions, and working hours. Several studies suggested how to make adjustments and recommended alternatives to the existing furniture and equipment at the workplace.

The present review found low quality evidence that those who received workplace interventions did not get more pain relief than those who received no interventions. We found moderate quality evidence (1 trial, 415 workers) that workplace interventions reduced sick leave among the workers at six month-, but not at three- and 12-month follow-ups. This could be due to the fact that few participants in the study were sick-listed. Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate for both pain and sickness absence.

SUMMARY OF FINDINGS FOR THE MAIN COMPARISON [\[Explanation\]](#)

workplace interventions compared to no intervention for neck pain					
Patient or population: patients with neck pain Settings: work places Intervention: workplace interventions Comparison: no intervention					
Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	No of Participants (studies)	Quality of the evidence (GRADE)
	Assumed risk	Corresponding risk			
	no intervention	workplace interventions			
Current pain at 10/12 months follow-up VAS and five-point scale. Scale from: 0 to 5/10. Follow-up: 10-12 months		The mean Current pain at 10/12 months follow-up in the intervention groups was 0.12 standard deviations lower (0.36 lower to 0.2 higher)		267 (2 studies)	⊕⊕○○ low ^{1,2}
*The basis for the assumed risk (e.g. the median control group risk across studies) is provided in footnotes. The corresponding risk (and its 95% confidence interval) is based on the assumed risk in the comparison group and the relative effect of the intervention (and its 95% CI). CI: Confidence interval;					
GRADE Working Group grades of evidence High quality: Further research is very unlikely to change our confidence in the estimate of effect. Moderate quality: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate. Low quality: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate. Very low quality: We are very uncertain about the estimate.					

¹ Uncertain allocation concealment, no participant and care provider blinding.

² 95% confidence interval includes no effect.

BACKGROUND

Neck pain in workers

Musculoskeletal disorders (MSD) are the most common causes of long-term sick-leave and disability pension in several industrial countries. Lost days due to MSD are 42%, 40% and 33% in Norway, Sweden and the United States, respectively (Nordlund 2004; Statistics Norway 2004; US Dept Labor 2004). Recurrent and chronic pain account for a substantial portion of worker absenteeism (Nachemson 2000; Nordlund 2004) and the low-back and neck comprise the most common pain locations. In addition to personal consequences, such disorders represent a large economic loss for society (Hansson 2005).

Neck pain seems to be more prominent in the general population than previously known (Lidgren 2008). A recent review showed that neck pain is common in the adult population; in the majority of studies included in the review, the annual prevalence was between 20% and 50% (Hogg-Johnson 2008). In another large review, the annual prevalence of neck pain among workers varied considerably across countries, from 27.1% in Norway and 33.7% in the UK, to 47.8% in Quebec, Canada (Côté 2008). In single studies, totally different occupations, such as dentists, nurses, office workers and crane operators have been shown to have a prevalence of neck pain above 50%, while the annual prevalence of sick leave due to neck pain varies in available studies from 5% to 10% (Côté 2008). Office and computer workers had the highest incidence of neck disorders (Côté 2008) amongst all occupations studied, which is higher than the prevalence in the general population (Hush 2006).

The causes for musculoskeletal disorders, including neck pain, are multifactorial (Bongers 2006; Côté 2008; Punnett 2004). Self-reported physical exposure such as sedentary positions in prolonged periods, repetitive work, cervical spine in flexion for prolonged time, working in awkward positions, inadequate keyboard and mouse position, no chair armrest, and upper extremity posture have been shown to be risk factors for neck pain (Ariens 2001; Côté 2008; van der Windt 2000). Self-reported psychosocial work exposure such as job strain, low co-worker support, decreased job security and overall stress at work have also been shown to be risk factors for neck pain (Ariens 2000; Bongers 2002; Boyle 2008; Côté 2008; van der Windt 2000). Individual factors such as age, gender, education (Côté 2008; Linton 2000) and non-work-related factors also contribute to the explanation of the prevalence of neck pain (Bongers 2002; Boyle 2008; Côté 2008). Neck pain is a condition characterised by lapses and relapses (Guzman 2008) that sometimes, but not always, result in episodes of sick leave. Due to this complexity, the contribution of different risk factors in the development and exacerbation of problems in the neck and shoulder may be difficult to explain.

Workplace interventions

Four premises have made the workplace a more focused arena for interventions. *First*, the responsibility for health and sick leave has gradually been transferred from the healthcare system to the employer. This has also been expressed through the model of Corporate Social Responsibilities (CRS), which, among other factors, targets the company's responsibilities towards their own employees' health and absence. Accordingly, new social policies and systems highlight a more spacious or inclusive working life (Norwegian Government 2005), where the stakeholders' involvement and closer contact between the employee and employer are anticipated (Aas 2008). An implication is that the workplace is a core intervention arena in western health and social policy. This development has been further expanded by promotion of the Disability Management (DM) movement (Westmorland 2004). *Second*, the understanding of work disability has gradually changed. It is now understood to be the result of a complex interaction between components at the body, individual and societal levels (WHO 2001), or the result of the interaction between the health care, the workplace and the social security system (Aas 2009; Loisel 2001). As a result, the workplace has become more important as an intervention arena. *Third*, workers who have not returned to work within two to three months are at high risk for developing disability and dropping out of the work arena (Frank 1996). Therefore, encouraging early return-to-work by intervening at the workplace level has been seen as an efficient way to reduce socioeconomic and personal consequences of musculoskeletal disorders (Elders 2004) and crucial for reducing the distance between the workplace and the sick-listed worker. *Finally*, the paradigm shift within the occupational rehabilitation field from "train-then-place" to "place-then-train" approaches (Corrigan 2001; Fadyl 2009) has strengthened the value of placement in a real context (e.g. the workplace) early in the rehabilitation process.

In this review, 'workplace interventions' (WI) were defined as: '*any action at the workplace with the aim of preventing health problems and disability, maintaining participation in work and reducing sickness absences, or facilitating early return-to-work. These interventions seek to modify the employees' physical or mental functions, their activity performance, participation challenges or the physical, social or attitudinal environment*'. We did not include workplace interventions that focused on *preventing health problems* in this review.

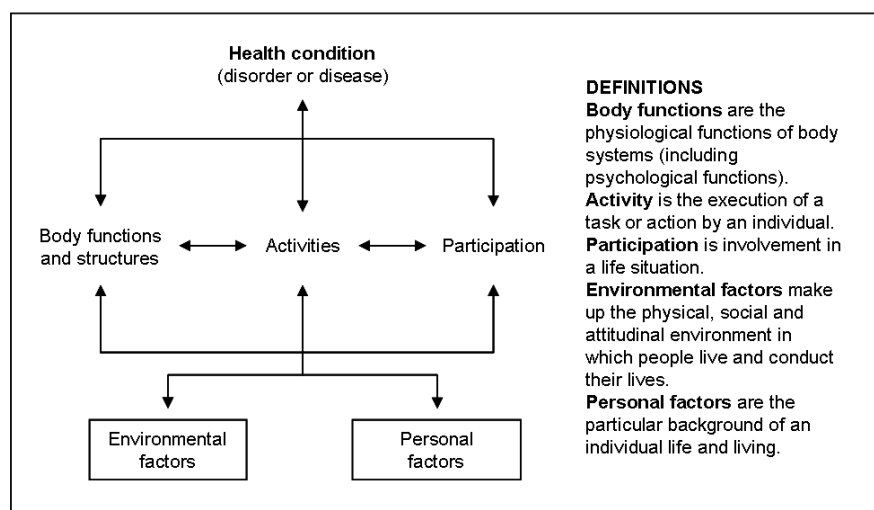
Workplace intervention outcomes

Complex phenomena such as neck pain and sickness absence (Côté 2008) often require complex approaches. Therefore, evidence from multi-component interventions is often needed and answering the question of which interventions work in combination becomes crucial. Multidimensional intervention strategies require the evaluation of many underlying concepts (Staal 2002). The International Classification of Functioning, Disability and

Health (ICF) (WHO 2001) offers a conceptual biopsychosocial model that describes health and function (Figure 1). The ICF and the International Classification of Diseases (ICD-10) make up the two core classification systems of the World Health Organization (WHO), where diseases, disorders and disabilities are included. The ICF codifies disabilities on different health and health-related dimensions within a framework of up to 1424 codes. For example, in the field of occupational health, the ICF has been used: to describe work-related factors that influence the health of employees (Heerkens 2004), to describe the content of specific outcome questionnaires (Grotle 2005), to assess function in relation to sick

leave and disablement pension (Brage 2004), and as a conceptual framework to guide the development of a broader perspective of ergonomic interventions (Leyshon 2008). The ICF includes health factors that can be modified by interventions (Verbeek 2004). Therefore, in this review, we used the ICF as a conceptual framework to describe, sort and analyse workplace interventions, according to whether the intervention was trying to change or modify body function (physical or mental), activity, participation, environmental factors (physical, social or attitudinal), personal factors, or a combination of these.

Figure 1. International Classification of functioning, disability and Health, ICF (WHO 2001). The model and definitions of the health and health-related components in ICF



A focus on reducing the consequences of musculoskeletal disorders (disability prevention) is proposed as a paradigm within occupational medicine (Loisel 2001). Thus, we envisioned that some of the workplace interventions would target the underlying causes of both pain and sickness absence, to enable workers to return to work in spite of their pain. Although there are no systematic reviews examining how the workplace affects sickness absence due to neck pain, studies have shown that the workplace does have an impact (Bergstrom 2007).

OBJECTIVES

The objective of this review was to determine the effectiveness of workplace interventions compared to no treatment, usual care or other workplace interventions for adult workers with neck pain.

METHODS

Criteria for considering studies for this review

Types of studies

Only randomised controlled trials (RCT) were included. There were no language limitations on the literature search.

Types of participants

Inclusion criteria:

- **Age:** Working age male and female adults (18 to 67 years).
- **Working status:** Workers at work or absent from work (on sick leave, early retirement or disability pension), but still connected to a workplace by employment agreements (permanent or temporary).
- **Job sectors:** All sectors, branches and types of jobs.
- **Conditions:** Workers with reported neck pain of acute (less than six weeks), subacute (six to 12 weeks) or chronic (12 weeks or more) duration were included. Shoulder pain was only included when it was described in conjunction with neck pain, otherwise, it was excluded. The fluctuating nature of neck pain led to a challenge when defining the target group for this review. We solved this by including studies where at least 50% of the baseline population had neck pain. The rationale for this strategy was that since neck pain is characterised by lapses and relapses, even if 100% of the study participants had neck pain at baseline, a lower percentage would have pain at short-, intermediate- and long-term follow-up, just by the nature of neck pain. Therefore, we also wanted to include studies where neck pain was not an inclusion criteria, but the annual prevalence of neck pain in the participants surpassed 50% at baseline.

Exclusion criteria:

- Neck pain due to specific pathological conditions (e.g. fractures, tumours, infections, inflammatory processes, ankylosing spondylitis).
- Studies with a baseline prevalence of neck pain below 50%.

Types of interventions

Inclusion criteria

Setting: Both group-based and individual interventions conducted at the workplace were included; interventions could be aimed at modifying:

- **Body function** (both physical and mental function; i.e. education and advice about workplace challenges, stress management and advice on correct positions, changing positions, relaxation, breaks)
- **Activity performance** (i.e. graded activity (only work-task performance adjustments, not exercises), methods of working,

biomechanical work techniques, lifting, pushing and pulling techniques (actual changes not just advice), job rotation, task adjustments)

- **Participation** (i.e. workload modifications, lighter work, work duration, reduced working hours, part-time work, flexible working hours, active sick leave, sick leave)
- **Environmental** (physical, social and attitudinal factors, i.e. workstation design, work layout changes, new equipment (chairs, tables, light, computer mouse, keyboard, lifting aid, office design, work space changes, communication and contact between supervisor and employee about social and attitudinal aspects, early contact, supervisor's and colleagues' abilities and attitudes, workplace culture, occupational health services, organizational changes, offer of work accommodation)
- **Personal factors** (i.e. life cycle adaptation, lifestyle redesign, changed habits, age-related adjustments)

The interventions could be a single strategy, or a *combination* of strategies, named with different intervention program labels (i.e. modified work, participatory ergonomic, ergonomic workplace visit, return-to-work interventions, multidisciplinary ergonomic interventions).

We performed these broad comparisons:

1. workplace intervention versus no interventions,
2. workplace intervention versus usual care,
3. comparison of two or more workplace interventions.

Exclusion criteria:

Setting: Clinical and healthcare interventions conducted outside the workplace were excluded.

Covered in other Cochrane Reviews:

- Exercise (also group gymnastics, fitness programs, aerobics, spinning, graded exercise programs) ([Kay 2005](#); [Schonstein 2003](#))
- Multidisciplinary biopsychosocial rehabilitation ([Karjalainen 2003](#))

Types of outcome measures

Harms and adverse effects were included if reported in the included studies. The timing of outcome measures was reported according to the descriptions used in the included studies. They were grouped as short-term (measured closest to four weeks post-randomisation), intermediate-term (measured closest to six months post-randomisation) and long-term (measured one year or longer post-randomisation) ([Furlan 2009](#)).

Primary outcomes

Trials measuring at least one of the following outcomes recommended by the Cochrane Back Review Group ([Furlan 2009](#)) were included:

1. Pain severity or pain prevalence (self-reported on a VAS or NSR scale, or measured as the proportion of those with pain)
2. Work absenteeism (time on benefits, number of hours/days on sick leave/lost time, proportion of individuals returning to work, employment status, and shift in employment status to working/part-time working/sick listed, disability pension and early retirement)

Secondary outcomes

1. Global improvement (proportion of participants recovered or improved, measured by an overall judgment of improvement or treatment effectiveness)
2. Functional status
3. Well-being / Quality of Life

Search methods for identification of studies

The search strategies for MEDLINE and EMBASE were developed according to the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2008) and the 2009 Updated method guidelines for systematic reviews in the Cochrane Back Review Group (Furlan 2009). Searches for CINAHL and PsychINFO were based on RCT search filters used at the Norwegian Knowledge Centre for the Health Services. Searches in the other databases were adapted as indicated from the search strategy for MEDLINE.

Electronic searches

Potential trials were identified with computer-aided searches (to July 2009) in these electronic bibliographic databases:

- CENTRAL (*The Cochrane Library* 2009, issue 3; Appendix 1)
- MEDLINE (Appendix 2)
- EMBASE (Appendix 3)
- CINAHL (Appendix 4)
- PsychINFO (Appendix 5)
- ISI Web of Science (Appendix 6)
- OTseeker (Occupational Therapy Systematic review of Evidence) (Appendix 7)
- PEDro (The Physiotherapy Evidence database) (Appendix 8)

The intervention section of the searches was purposely left open, because of the diversity of terms used to describe workplace interventions.

Searching other resources

We screened references cited in included trials, and contacted experts in the field for further studies.

Data collection and analysis

We followed the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2008) and the 2009 Updated method guidelines for systematic reviews in the Cochrane Back Review Group (Furlan 2009) for these steps.

Selection of studies

The titles and abstracts (if available) of all identified studies were collected and duplicates were removed before study selection. We pilot tested our interpretation of the inclusion criteria on a sample of ten articles, including some considered to be definitely eligible, some definitely not eligible and some questionable. Thereby, the inclusion form was revised. The full text of articles whose abstracts appeared to meet our inclusion criteria, those for which we could not make a decision based on the abstract, or articles for which there were no abstracts, were obtained and independently screened by the same two review authors to determine if they met our inclusion criteria. Consensus was used to solve disagreements; if disagreements persisted, a third review author was consulted.

Data extraction and management

Two review authors independently extracted the data from the included studies onto a standardised form that included characteristics of the participants, interventions, outcomes and results. The form was developed on the basis of experiences of others. Consensus was used to solve disagreements; if disagreements persisted, a third review author was consulted.

Assessment of risk of bias in included studies

The risk of bias in the included studies was assessed using 12 criteria recommended by the Cochrane Back Review Group (Furlan 2009) and based on *The Cochrane Handbook* (Higgins 2008) and are defined in Appendix 9. The criteria were scored 'yes', 'no' or 'unclear' and are reported in the *Risk of Bias* tables. A trial with low risk of bias was defined as a trial that met, at a minimum, criteria 1 (randomisation), 2 (allocation concealment), 5 (outcome assessor blinding) and any three of the other criteria. Two review authors independently assessed a selection of trials for risk of bias and reached consensus on the final results. A third review author assessed the risk of bias for all included studies.

Measures of treatment effect

Due to between-study diversity of interventions, outcomes and outcome measures, type of workers and follow-up times, only one meta-analysis could be performed. In that case, the two studies were homogeneous in their goal: both focused on the body function level. We calculated odds ratios (OR) for dichotomous data

and mean differences (MD) for continuous data with 95% confidence intervals (CI) for the outcomes.

Approximately half of the results were from continuous outcomes (musculoskeletal discomfort, pain intensity (worst pain, average pain, current pain), and days on sick leave), and the other half were dichotomous outcomes (prevalence of: neck pain, discomfort, those reporting much stress, recovered, disabled, months without symptoms, and musculoskeletal sick leave).

Some of the studies tested a single intervention; some tested a set

of interventions. Therefore, a content analysis of the interventions as outlined in the text of the included papers was performed to describe the exact content of the intervention. For this analysis, we used the ICF (WHO 2001) as a conceptual framework to help describe the intervention components in the included studies. As an overview, we presented the components, techniques and doses of the combined interventions in Table 1, using the ICF terminology.

Table 1. Description of interventions in included studies

Study	Intervention	Control	Interventions targeting mental body functions [BF-mental health education]	Interventions targeting musculoskeletal body functions [BF-physical education] [BF-relaxation-breaks]	Interventions modifying activity performance [A-modification]	Interventions modifying physical environment [E-physical modification]	Intensity / frequency	Descriptions and aims
Bernaards 2007	Intervention 1 WS: Work style group (WS) Intervention 2 WSPA: Work style (WS) + lifestyle physical activity (PA)-group	No intervention	WS: increasing awareness of coping with high work demands and adjustments of workplace accordingly	WS: awareness of taking break, body posture and workplace adjustments PA: moderate to heavy intensive physical activities			6 meetings/ 15 to 60 minutes each, during 6 months	Four large meetings <10 persons, two small meetings <3 persons. Trained counsellor / standardised protocol. Aim for both was behavioural change
Fostervold 2006	Computer screen angle -high line of sight (HLS)	Computer screen angle -low line of sight (LLS)				HLS: 15 ° lower than a horizontal line to the midpoint of the screen LLS: low line of sight: 30 ° lower than a horizontal line	Permanent	Aim is to reduced subjective symptoms, optometric status, musculoskeletal load and other health-related vari-

Table 1. Description of interventions in included studies (Continued)

						to the mid-point of the screen		ables
Haukka 2008	Participatory ergonomic intervention (PEI)	No intervention	Phase 1: pre-implementation: active workshop identifying mental workload	Phase 1: pre-implementation: active workshop with ergonomic identification of risks and problems, and planning solutions	Phase 2: implementation of 402 ergonomic changes (how many targeted the tasks)	Phase 2: implementation of 402 ergonomic changes (how many targeted the environment?)	11 months, 6 workshops a 3 hours each, during 9 to 12 months	Built on a Finnish Participatory Ergonomic model. Aim was to prevent musculoskeletal disorders
Horneij 2001	Workplace stress management group	No intervention (live as usual)	Identify and reach goals and strategies for stress (from lack of social support, low decision latitude, high psychological workload)				12 groups, 7 meetings over 7 weeks, 1.5 hours each. Two follow-up meetings after 3 and 6 months.	Immediate supervisor invited to join the 6th and/or 7th meeting. All participants from one workplace. Aim was to reach goals and strategies to reduce perceived stress.
Hedge 1999	Downward tilted computer keyboard on a tray	Conventional keyboard on a flat tray				Downward tilted computer keyboard on a tray	Permanent	
Kamwendo 1991	Intervention 1: Traditional neck school (TNS) Intervention 2: Reinforced neck school	No care	RNS: interview by a psychologist on psychosocial work factors to arrive at a personal coping	TNS: education about body function and ergonomics, included pause-gymnastics and		RNS: workplace visit, discussion of ergonomic adjustments	TNS: 4 hours RNS: 4 hours + 2 hours	TNS: To provide them with knowledge of appropriate measures to pre-

Table 1. Description of interventions in included studies (Continued)

	(RNS)		strategy	relaxation				vent work-related neck and shoulder pain
Ketola 2002	Intervention 1: Intensive ergonomics (IE) Intervention 2: Ergonomic education (EE)	No care, received a leaflet		IE: work site visit including: to take breaks during work, pay attention to work posture. The worker could participate actively EE: group training session: Encourage to take short pauses		IE: Worksite visit including: layout environmental conditions of the workroom, and adjustments of the workstation. EE: group training session: Encourage to evaluate their own workstation and implement change, and ask for equipment if needed	IE: 1.5 to 2 hours EE: 1 hour	
Morken 2002a	Coping group sessions of MSD at the workplace	No care		Group meeting aimed at coping with MSD. Ten different topics; as musculoskeletal disorders, coping with MSD symptoms	Group meeting aimed at coping with MSD. Ten different topics; as working technique, working positions	Group meeting aimed at coping with MSD. Ten different topics; as optimal design of the workplace	10 meetings	Three intervention groups receiving the same interventions but containing different stakeholders + changes in working environment.
van den Heuvel 2003	Intervention 1: Rest breaks (RB) Intervention 2: Rest breaks	C: Usual care		RB: five minutes rest every 35 minutes introduced by			RB: 5 min rest every 35 min and 7 sec rest every 5 min.	

Table 1. Description of interventions in included studies (Continued)

	(RB) + exercise (E)			a computer program. E: four physical exercises of 45 seconds duration			E: As above + physical exercises of 45 sec duration	
Voerman 2007	MTEC: Ambulant myo-feedback training (MT) and ergonomic counselling (EC)	Ergonomic counselling (EC)		MTEC: Instructed to relax as a response to the myo-feedback	EC: workplace visit included ergonomic investigation (work task, work hour, work load)	EC: workplace visit included ergonomic investigation and modifying the existing work station	MTEC and EC: 4 weeks	Myofeed-back training: Sounds that are playing when muscles need relaxation. Ergonomic counselling: visited weekly by a therapist

Physical exercises are not further described as these are not included in this review (only included when provided in combination with included interventions).

Assessing whether a specific intervention makes a clinical difference should not be based only on statistically significant findings. Thus, we tried to address five questions in order to determine the clinical relevance of the intervention (Furlan 2009), see (Appendix 10).

Dealing with missing data

We dealt with missing data according to the recommendations in the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2008); we contacted original investigators to request missing data, we made any assumptions of methods used to cope with missing data explicit, and we addressed the potential impact of missing data.

Data synthesis

Whether we had sufficient data to combine the results statistically or not, we assessed the overall quality of the evidence for our primary outcomes by using an adapted GRADE approach (Furlan 2009). The quality of the evidence for a specific outcome was based on the performance against five domains: limitations of the study

design, inconsistency, indirectness (inability to generalise) and imprecision (insufficient or imprecise data) of results and publication bias across all studies that measured that particular outcome. Two review authors independently performed the GRADE analysis. The quality started at *high* when at least two RCTs with a low risk of bias provided results for the outcome, and reduced by one level for each of the domains not met.

High quality evidence = there were consistent findings among at least 75% of RCTs with no limitations of the study design, consistent, direct and precise data and no known or suspected publication biases. Further research is unlikely to change either the estimate or our confidence in the results.

Moderate quality evidence = one of the domains was not met. Further research is likely to have an important impact on our confidence in the estimate of effect and might change the estimate.

Low quality evidence = two of the domains were not met. Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.

Very low quality evidence = three of the domains were not met. We are very uncertain about the estimate.

No evidence = no RCTs were identified that addressed this out-

come

Subgroup analysis and investigation of heterogeneity

No subgroup analysis or investigation of heterogeneity was performed.

Sensitivity analysis

There were no data available with which to perform a sensitivity analysis.

RESULTS

Description of studies

See: [Characteristics of included studies](#); [Characteristics of excluded studies](#).

See: [Characteristics of included studies](#); [Characteristics of excluded studies](#).

Results of the search

The search strategy identified 1995 references. The searches were performed up to July 2009, according to the guidelines from the Cochrane Back Review Group. In total, the search identified 182 references in CENTRAL, 439 references in MEDLINE, 672 references in EMBASE, 167 references in CINAHL, 120 references in PsycINFO, 249 references in ISI Web of Science, 118 references in OTseeker, and 48 references in PEDro. After removing duplicates, 1427 references remained.

The titles and abstracts were scrutinized and assessed by two reviewer authors, and when information necessary for inclusion

was lacking, the full-text articles were read. The full text of 26 articles was obtained. Of these, nine articles were included (see [Characteristics of included studies](#)). Handsearching the reference lists of included studies identified three additional references to be scrutinised by full-text; one of them was included ([Hedge 1999](#)). Contacts were made with eight experts in the field, but they did not generate additional studies. Therefore, a total of ten studies were included.

Included studies

Participants and type of jobs

The total number of participants in the ten included studies was 4179. In one study, one of the intervention arms was physical activity ([Horneij 2001](#)), and was not included in the analyses because it met the exclusion criteria for physical exercises. In another study, one of the control groups was not randomised, so this group was also excluded from the review ([Morken 2002a](#)). When subtracting these participants (90 and 1344 respectively), the remaining number of participants in the included studies became 2745. [Table 2](#) gives an overview of the characteristics of the included studies. Seven of the studies dealt mainly with computer workers ([Bernaards 2007](#); [Fostervold 2006](#); [Hedge 1999](#); [Kamwendo 1991](#); [Ketola 2002](#); [Voerman 2007](#); [van den Heuvel 2003](#)), but they had different type of jobs: social security workers, secretaries, technicians, engineers, drafts people, and architects. One of these studies dealt with office workers who were medical secretaries, but the trial was performed before computers were a common work tool ([Kamwendo 1991](#)). The dominant gender varied according to type of work. In the aluminium industry, the participants were 84% male ([Morken 2002a](#)), and in the study in hospitals and municipal home-care, the participants were all female ([Horneij 2001](#)). In the remaining studies, gender was more equally distributed.

Table 2. Descriptions of included studies

Study	Country	Region	Branches	Type of workers	Work status and sickness absence	Basis for inclusion
Bernaards 2007	The Netherlands	Different regions	Head offices of seven companies	Computer workers	Working mean 4 1/2 days/week. Sickness absence: working at least 50% of total working time (inclusion criteria), sick leave not reported at baseline, or later	1

Table 2. Descriptions of included studies (Continued)

Fostervold 2006	Norway	Oslo	National Insurance Office	Computer workers	Working between 70-100% av normal working hours. Sickness Absence: Not reported	2
Haukka 2008	Finland	Four large cities	Schools, nursery, nursing homes	Kitchen workers; service managers, chefs, cooks, kitchen aids	Working > 6 hours a day. Sickness absence: Between 16-19% had MSD-related sick leave at 3 month follow-up	2
Hedge 1999	US	Phoenix	Large office building	Computer workers	Full time workers. Sickness absence not reported.	2
Horneij 2001	Sweden	A medium sized city	Homebased care	Nursing aids and assistant nurses	25% working full time / 75% 50-94%. 13% had been on sick leave the preceding 12 months, but not reported during the study	2
Kamwendo 1991	Sweden	Not known	Hospital	Medical secretaries	Working 73% full time, e.g. 40 h/w, 27% < 30 h/w. Sick absence: Almost nothing 6 months before and after the program.	1
Ketola 2002	Finland	One medium sized city in Southern Sweden	Administrational units	Computer- / VDU-workers; secretaries, technicians, engineers, draft persons	Working status: Not reported. Sick absence status: Not reported.	1
Morken 2002a	Norway	Not known	Eight aluminium plants	Operators (67%), of-	Work status: Not re-	2

Table 2. Descriptions of included studies (Continued)

				office workers (20%), managers (N=8%)	ported. Sickness absence: All participants are assumed working, not being sick listed	
van den Heuvel 2003	The Netherlands	Not known	Social security insurance offices (N=22)	Computer workers	Working at least four days a week. Sickness absence: 6,3-9,5% of participants were sick listed before, and 3.8-6.2% after intervention.	1
Voerman 2007	The Netherlands and Sweden	Area of Enschede (the Netherlands) and area of Goteborg (Sweden)	Recruitment and health care	Job counselors, medical secretaries	Working > 20 hours a week. Sickness absence status: Not reported	1

1= inclusion criteria = all participants must have neck pain. 2= inclusion criteria = each participant did not have to have neck pain, but > 50% of the participants had neck pain at baseline

Eight of the articles reported prevalence of neck pain at baseline, which varied from 54% to 90%. One study reported a 54% to 61% prevalence of neck pain during the preceding year (Horneij 2001). One article did not report neck prevalence, but according to information from the author, the cumulative prevalence of neck pain in the past week was 100% (van den Heuvel 2003). None of the studies had sickness absence as an inclusion criterion. In all studies, participants were assumed to be working full- or part-time; however, status on sickness absence was not reported.

The interventions

Altogether, six types of intervention combinations were used in six studies. These were: one four-component combination (Haukka 2008), one three-component combination (Morken 2002a), and four different two-component combinations (Bernards 2007; Kamwendo 1991; Ketola 2002; Voerman 2007). Five studies provided single component workplace interventions: mental health education (Horneij 2001), physical education, relaxation and breaks (Kamwendo 1991; van den Heuvel 2003), and physical environmental modifications (Fostervold 2006; Hedge 1999). Table 1 gives an overview of the interventions in the ten included studies using the authors' own terms mapped onto uniform terminology

of the ICF (WHO 2001).

Three types of interventions targeting the *Body Functions* domain were examined in the included studies; education for mental health, education for physical health and relaxation breaks. The last two were combined into one group (Table 1), as they both targeted musculoskeletal body functions. The mental health education interventions were aimed at behavioural change and coping with high work demands. Interventions targeting the *Activity* domain were seen less often. These interventions were described as modifying work tasks, work load, work techniques, work positions, and work hours. They were defined during group meetings or workplace visits. Interventions targeting the *Environmental* domain modified the physical environment. These were often individually-tailored interventions following an assessment during a workplace visit or a group session that identified individual needs. Sometimes they were also given to all employees (for example, downward tilted computer keyboards or screen angle modifications). In most cases, several adjustments and alterations of the existing furniture and work equipment were provided. Education for physical health, relaxation, breaks and physical modifications to the environment were the most often examined interventions in the included studies. No interventions targeted modifications

of social or attitudinal environments, participation or personal factors domains. These interventions were given separately, or provided as different combinations of intervention programs.

The control groups

In seven studies, the control group received no intervention (Bernards 2007; Haukka 2008; Hedge 1999; Horneij 2001; Kamwendo 1991; Ketola 2002; Morken 2002a). However, in one of these studies, an information leaflet was given (Ketola 2002). In the analyses, this was regarded as no intervention. In another study, the control group received ergonomic adjustments of the workplace and received a booklet (van den Heuvel 2003). This was regarded as usual care. Finally, three studies compared two workplace interventions (Fostervold 2006; Hedge 1999, Voerman 2007).

The comparisons included in the studies varied to a large extent. Several studies compared two intervention groups to one control group (Bernards 2007; Horneij 2001; Kamwendo 1991; Ketola

2002; van den Heuvel 2003). One of these studies (Horneij 2001) had a control group with no intervention and another intervention arm that provided an individual physical training program, which was excluded from further analysis in this review, according to our exclusion criteria. One study (Morken 2002a) had three intervention groups providing the same interventions, but to different participants; e.g. in two of the groups the supervisors and/or managers also participated. This study had two control groups, but one of the control groups was not randomised and was excluded from the review.

Outcomes

Outcome measures and their timing are described in Table 3. All ten studies reported pain severity or pain prevalence, while only three studies measured sickness absence. However, data were available for further analysis (after contacting the authors) for only seven of them; seven on pain and only one on sickness absence. No studies reported harms or adverse effects.

Table 3. Descriptions of outcomes in included studies

Included studies author (Year)	Outcome group	Relevant outcome reported	Short-term	Intermediate-term	Long-term
Bernards 2007	Pain severity	average pain last 4 weeks		6m	12m
		current pain ¹		6m	12m
		worst pain last 4 weeks		6m	12m ²
	Functional or disability status	prevalence recovered		6m	12m
		prevalence disabled		6m	12m
	Pain severity	0, 1-2, 3-6 months without symptoms		6m	12m ³
Fostervold 2006	Pain severity	discomfort in neck/shoulder			12m
Haukka 2008	Pain severity	prevalence of neck pain	3m	6m,9m	12m,15m, 18m,21m,24m
	Well being	prevalence reporting "much stress"	pi ⁴		12m

Table 3. Descriptions of outcomes in included studies (Continued)

	Work absenteeism	prevalence of MS-sick leave past 3 months	3m	6m ⁵ , 9m	12m, 15m, 18m, 21m, 24m
Hedge 1999	Pain severity	prevalence of neck pain	3w		
Ketola 2002	Pain severity	MSD discomfort in neck ¹	2m ⁶	10m	
Morken 2002a	Pain severity	MSD discomfort in neck last 12 months			16m
Horneij 2001	Pain severity	Change in interference due to neck-shoulder pain previous month			12m, 18m
	Pain severity	Change in pain drawing, neck-shoulder previous month			12m

Notes: Data for analysis of intervention effects were available for seven out of ten studies. Abbreviations: w = weeks, m = months MS = Musculoskeletal, MSD = Musculoskeletal disorders, pi = post intervention. ¹ These outcomes were pooled (meta-analysis), ² Significance favours control vs. intervention 2 ($P < 0.00001$), ³ 1 to 2 month without symptoms: Significance favours experimental, both intervention 1 ($P = 0.05$) and intervention 2 ($P = 0.05$), ⁴ Significance favours controls ($P = 0.05$), ⁵ Significance favours experimental ($P = 0.03$) ⁶ Significance favours experimental, intervention 1 ($P = 0.03$) and intervention 2 ($P = 0.007$)

Excluded studies

Eighteen studies were excluded after reading the full text of the articles and receiving unpublished information from the authors. See [Characteristics of excluded studies](#) which describes the reason for exclusion.

Risk of bias in included studies

In all studies, the first author was contacted for missing information concerning risk of bias criteria (see [Figure 2](#) for individual risk of bias assessments). Two of the studies were rated as having low risk of bias ([Bernards 2007](#); [Haukka 2008](#)).

Figure 2. Methodological quality summary: review authors' judgements about each methodological quality item for each included study.

	Adequate sequence generation?	Allocation concealment?	Blinding? (All outcomes - participants?)	Blinding? (All outcomes - providers?)	Blinding? (All outcomes - outcome assessors?)	Incomplete outcome data addressed? (All outcomes - drop-outs?)	Incomplete outcome data addressed? (All outcomes - ITT analysis?)	Free of selective reporting?	Similarity of baseline characteristics?	Co-interventions avoided or similar?	Compliance acceptable?	Timing outcome assessments similar?
Bernaards 2007	+	+	-	-	+	-	+	+	+	+	-	+
Fostervold 2006	+	+	-	-	-	+	+	+	+	+	+	+
Haukka 2008	+	+	-	-	+	+	+	+	+	+	+	+
Hedge 1999	+	-	-	-	+	-	-	+	+	+	+	+
Horneij 2001	+	?	-	-	+	-	+	+	+	+	+	+
Kamwendo 1991	+	?	-	-	?	?	?	+	?	+	+	+
Ketola 2002	+	?	-	-	+	+	+	+	+	+	?	+
Morken 2002a	+	+	-	-	-	+	+	+	+	+	+	+
van den Heuvel 2003	+	-	-	-	-	+	+	+	-	+	+	+
Voerman 2007	+	?	-	-	-	+	+	+	+	+	+	+

Allocation

All studies had adequate sequence generation as this was an inclusion criterion (only RCT-design). Only one article reported concealed allocation. When the other authors were asked to clarify this, three authors reported adequately performed allocation concealment, and two authors reported inadequately concealed allocation. In four articles, this issue remains unclear.

Blinding

Lack of blinding of participants and care providers was the most common shortcoming, since this was not possible in any of the studies. When it came to blinding of the outcome assessor, blinding was performed in five studies, not performed in four studies and unclear in one study.

Incomplete outcome data

The dropout rate was acceptable in six studies, not acceptable in three studies, and unclear in one study. Intention-to-treat analyses were performed in eight studies, not performed in one study, and unclear in one study.

Selective reporting

All studies appeared to be free from selective outcome reporting.

Other potential sources of bias

Timing of outcomes assessment was similar in all groups within the studies. Co-interventions were avoided or similar in all studies. Compliance to the intervention was acceptable in eight studies, not acceptable in one study, and unclear in one study. Finally, similarity of baseline characteristics was acceptable in eight studies, unacceptable in one study and unclear in one study.

Effects of interventions

See: [Summary of findings for the main comparison workplace interventions compared to no intervention for neck pain](#)

Data for analysis of intervention effects were available for seven out of ten studies. The results of the three studies that were not analysed due to lack of data, are summarised in the text when relevant, but conclusions are not given. Only between-group results are presented (showing differences between index and control intervention), even though the authors included within group changes in the original papers. All the results of the relevant outcomes are given in [Table 3](#). The quality of the evidence is presented in [Table 4](#), along with the reasons for downgrading.

Table 4. Grade of evidence analysis (GRADE)

GRADE criteria						
Study	1. Limitation of the study design	2. Inconsistency	3. Indirectness (inability to generalize)	4. Imprecision of results (insufficient or imprecise data)	5. Publication bias (across all studies assessing the outcome)	Conclusion from the GRADE- assessment
Four-component workplace intervention versus no intervention						
Haukka 2008	No	No	No	Serious (-1) ¹	Unlikely	Pain: Moderate quality evidence Sickness absence: Moderate quality evidence
Three-component workplace intervention versus no intervention						
Morken 2002a	Serious (-1) ³	No	No	Serious (-1) ⁵	Unlikely	Pain: Low quality evidence Sickness absence: No

Table 4. Grade of evidence analysis (GRADE) (Continued)

						evidence ²
Two-component workplace intervention versus no intervention						
Bernaards 2007	No	No	No	Serious (-1) ¹	Unlikely	Pain: Moderate quality evidence Sick-ness absence: No evidence ²
Ketola 2002	Serious (-1) ⁷	No	No	Serious (-1) ⁵	Unlikely	Pain: Low quality evidence Sick-ness absence: No evidence
Kamwendo 1991	Very serious (-2) ₆	No	No	Serious (-1) ^{5,1}	Unlikely	Pain: Very low quality evidence Sickness absence: Very low
One-component workplace intervention versus no intervention						
Horneij 2001	Serious (-1) ⁴	No	No	Serious (-1) ⁵	Unlikely	Pain: Low quality evidence Sick-ness absence: No evidence ²
Kamwendo 1991	Very serious (-2) ₆	No	No	Serious (-1) ^{5,1}	Unlikely	Pain: Very low quality evidence Sickness absence: Very low
Physical health education, relaxation and breaks versus usual care						
van den Heuvel 2003	Serious (-1) ⁸	No	No	Serious (-1) ^{5,1}	Unlikely	Pain: Low quality evidence Sickness absence: Low quality evidence
Activity modifications and physical environmental modifications versus physical health education, relaxation and breaks						
Voerman 2007	Serious (-1) ⁹	No	No	Serious (-1) ⁵	Unlikely	Pain: Low quality evidence Sick-ness absence: No evidence ²

Table 4. Grade of evidence analysis (GRADE) (Continued)

Physical environment modifications versus another physical environment modification						
Fostervold 2006	Serious (-1) ³	No	No	Serious (-1) ¹	Unlikely	Pain: Low quality evidence Sick- ness absence:No evidence ²
Hedge 1999	Serious (-1) ⁴	No	No	Serious (-1) ¹	Unlikely	Pain: Low quality evidence Sick- ness absence:No evidence ²

1. Total number of events being < 300 and thus have wide confidence intervals and likelihood of random errors, 2. Sickness absence is not an outcome in this study, 3. Lack of blinding of participants, care providers and outcome assessors, 4. Lack of concealed allocation, lack of/unclear blinding of participants and care provider, and large loss to follow up, 5. Total number of participants being < 400 and thus have wide confidence intervals and likelihood of random errors, 6. Unclear allocation concealment, lack of blinding of participants and care provider, unclear blinding of outcome assessor, and unclear addressing of incomplete outcome data, 7. Unclear allocation concealment and lack of blinding of participants and care provider, 8. Lack of concealed allocation, and lack of blinding of participants, care provider and outcome assessor, 9. Unclear allocation concealment and lack of blinding of participants, care provider and outcome assessor.

I. Workplace intervention versus no interventions

a. Four-component workplace intervention versus no intervention

Quantitative results

Only two of the studies comparing workplace interventions with no interventions had comparable type of workers (computer/VDU workers) (Bernaards 2007; Ketola 2002), follow-up time, and outcome of pain severity, and therefore, were pooled. The meta-analysis (Summary of findings for the main comparison) revealed no significant differences in pain prevalence in the long-term (MD -0.12, 95% CI -0.36 to 0.12).

Conclusion: There is low quality evidence (2 trials, 267 people), that there is little or no difference between a two-component workplace intervention and no intervention on pain severity at long-term follow-up.

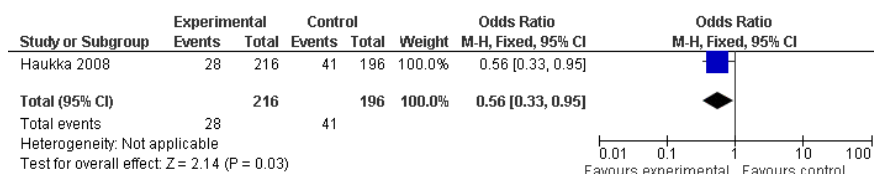
Qualitative descriptive results

The narrative analysis using ICF revealed different types of four-, three-, and two components workplace interventions compared to no interventions.

ai. Mental health education, physical health education, relaxation & breaks, activity modifications, and physical environmental modifications

One study (Haukka 2008) assessed the effect of combining four intervention components; (1) mental health education, (2) physical health education, relaxation and breaks, (3) activity modifications, and (4) physical environmental modifications, compared to no interventions. The program was a so-called 'participatory ergonomic intervention' program. There were no significant differences in pain prevalence in the short-term (OR 1.43; 95% CI 0.95 to 2.14), intermediate-term (OR 0.80, 95% CI 0.52 to 1.21) or long-term (OR 1.13, 95% CI 0.69 to 1.87). There was a significant difference in sick leave (Figure 3) in the intermediate-term (OR 0.56, 95% CI 0.33 to 0.95), but not in the short-term (OR 0.83, 95% CI 0.52 to 1.34) or long-term (OR 1.28, 95% CI 0.73 to 2.26). These results on sick leave were not presented in the included paper, but found by the review team after analysing the sickness absence data we received from the authors.

Figure 3. Forest plot of comparison: Four component workplace intervention versus no intervention. Intermediate-term effect: Prevalence of musculoskeletal sick leave past 3 months



Conclusion: There is moderate quality evidence (1 trial, 295 people) that there were no significant differences in short-, intermediate- or long-term follow-up for the prevalence of neck pain between those who received this four-component workplace intervention and those who received no interventions. There is moderate quality evidence (1 trial, 415 people) that those who received this workplace intervention were significantly less likely to be sick-listed in the intermediate-term than those who received no interventions. The differences were not significant at short-term and long-term follow-up.

b. Three-component workplace intervention versus no interventions

bi. Physical health education, relaxation & breaks, activity modifications, and physical environmental modifications

One study evaluated a three-component workplace intervention (Morken 2002a) that combined (1) physical health education, relaxation and breaks, (2) activity modifications, and (3) physical environmental modifications versus no interventions. This was a one-year group training program for three groups; employees only, employees and supervisors, supervisors only. None of the between-group differences in pain prevalence were significant between groups (employees only: MD 0.01, 95% CI -0.21 to 0.23, employees and supervisors: MD 0.12, 95% CI -0.11 to 0.35, supervisors only: MD -0.04, 95% CI -0.24 to 0.16) on long term follow-up.

Conclusion: There is low quality evidence (1 trial, three arms; 601, 599 and 629 people) that there is no significant difference in pain severity between the group who received the three-component intervention and those who received no intervention. There is no evidence on sickness absence.

c. Two-component workplace interventions versus no intervention

Three studies evaluated different two-component intervention programs.

c1. Mental health education, and physical health education, relaxation and breaks

One of the studies (Bernards 2007) combined (1) mental health education, with (2) physical health education, relaxation and breaks, and compared them to no intervention. The study had two arms; (i) a work style group, and (ii) a work style plus lifestyle physical activity group, both with the same intervention combination. There were no significant differences in pain severity in the intermediate-term (arm 1: MD 0.30, 95% CI -0.26 to 0.86, arm 2: MD 0.20, 95% CI -0.37 to 0.77) or long-term (arm 1: MD -0.20, 95% CI -0.84 to 0.44, arm 2: MD -0.10, 95% CI -0.73 to 0.53). For the outcome 'time without symptoms', those with one to two months without symptoms at the assessment time had significant differences at long-term (arm 1: OR 2.01, 95% CI 1.00 to 4.03, arm 2: OR 2.03, 95% CI 1.01 to 4.08), but the differences were smaller and not significant at intermediate-term (arm 1: OR 1.32, 95% CI 0.73 to 2.41, arm 2: OR 1.18, 95% CI 0.64 to 2.19). For the rest of the outcomes measured in this study, the results showed small or no differences between the experimental and control groups, at both intermediate-term and long-term.

Conclusion: There is moderate quality evidence that there is no significant difference in current neck pain, measured at intermediate-term (1 trial, two arms; 266 and 259 people) or at long-term follow-up (1 study, two arms; 210 and 209 people). There is conflicting evidence (1 study, two arms; 264 and 257) for time without symptoms (no time, one to two months, three to six months), at both intermediate- and long term follow-up. There is no evidence on sickness absence for this type of intervention.

c2. Physical health education, relaxation & breaks, and physical environment modifications

The second study (Ketola 2002) combined (1) physical health education, relaxation and breaks with (2) physical environment modifications, and compared them to no intervention. The study had two intervention arms: (i) intensive ergonomics, and (ii) ergonomic education, both with the same intervention combina-

tion. The study revealed significant differences in pain severity for both intervention arms in the short-term (arm 1: MD -0.60, 95% CI -1.15 to -0.05; Figure 4, arm 2: MD -0.60, 95% CI -1.04 to -0.16; Figure 5), but not at intermediate-term follow-up (arm 1: MD -0.30, 95% CI -0.85 to 0.25; and arm 2: MD -0.25-0.77 to 0.28).

Figure 4. Forest plot of comparison: Two component workplace intervention versus no intervention. Short-term effect. Outcome: Musculoskeletal discomfort in the neck (Arm: Intensive ergonomic).

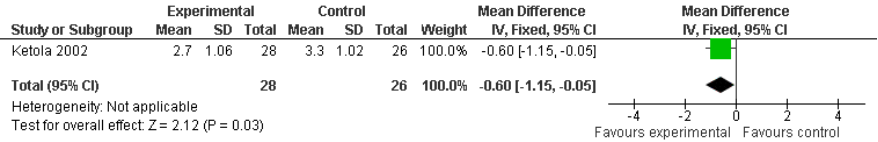
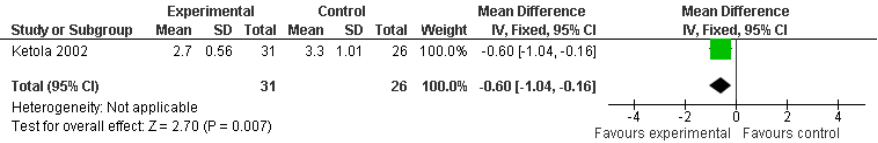


Figure 5. Forest plot of comparison: Two component workplace intervention versus no intervention. Short-term effect: Outcome: Musculoskeletal discomfort in the neck (Arm: Ergonomic education)



Conclusion: There is low quality evidence (1 trial - two arms; 54 and 57 people) that a two-component workplace intervention is more effective than no intervention in pain severity in the short-term. However, there were no significant differences at the intermediate-term (1 study, 54 and 57 people). There is no evidence on sickness absence for this type of intervention.

c3. Mental health education, and physical environment modifications

The third study (Kamwendo 1991) contained a two-component intervention program consisting of (1) mental health education, and (2) physical environment modifications versus no interventions. The study had two arms. According to the article reporting this study (Kamwendo 1991), they found no significant differences between the interventions and control group on pain and sick leave. As we did not have statistics from this study, no conclusion has been drawn.

d. One component workplace interventions versus no intervention

di. Mental health education

One study (Horneij 2001) assessed the effect of mental health education versus no intervention on pain prevalence. In the long-term, no significant differences in pain severity (MD 7.70, 95% CI -13.73 to 29.13) were found.

Conclusion: There is low quality evidence from one trial (43 people) that there is no significant difference in neck pain between those receiving workplace interventions and those receiving no interventions at long-term follow-up.

dii. Physical health education, relaxation and breaks

One study (Kamwendo 1991) assessed the effect of physical health education and/or relaxation and breaks versus no interventions on pain prevalence or pain severity. According to the authors, their study revealed no significant differences between the intervention and control group on pain and sick leave. As we did not have statistics from this study, no conclusion has been drawn.

2. Workplace intervention versus usual care

Quantitative results

It was not possible to pool the results for this comparison, due to lack of statistics.

Qualitative descriptive results

a. Physical health education, relaxation and breaks versus usual care

One study (van den Heuvel 2003) assessed the effect of (i) physical health education, (ii) relaxation and breaks compared to usual care. Arm I only included rest breaks, while arm II included rest breaks with exercises. Data were not available for further analysis of intervention effects, but the authors reported that more subjects in the intervention groups than in the control group reported change in their complaints (55% versus 34%) at short-term follow-up, but no differences were seen in self-reported sick leave. As we did not have statistics from this study, no conclusion has been drawn.

3. Comparison of two or more workplace interventions

Quantitative results

It was not possible to pool the results for this comparison, due to lack of statistics, and different follow-up times.

Qualitative descriptive results

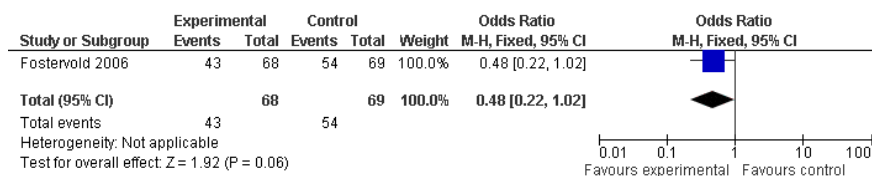
a. Activity modifications and physical environmental modifications versus physical health education, relaxation and breaks

One study (Voerman 2007) assessed the effect of two-component combinations, containing activity modifications and physical environmental modifications versus physical health education, relaxation and breaks (ambulant myo-feedback training and ergonomic counselling). The authors reported that none of the between-group differences for pain prevalence or disability were significant. As we did not have statistics from this study, no conclusion has been drawn.

b. Physical environment modifications versus another physical environment modification

Two studies (Fostervold 2006; Hedge 1999) assessed the effect of one physical environment modification versus another physical environment modification (computer equipment adjustments of screen and table) on pain severity. Both studies focused on computer workers. The results from these two studies were not pooled because they used different follow-up times. There were small but not significant differences between the two groups in pain prevalence at short-term (Hedge 1999: OR 0.47, 95% CI 0.12 to 1.76) and long-term follow-up (Fostervold 2006: OR 0.48, 95% CI 0.22 to 1.02) (Figure 6).

Figure 6. Forest plot of comparison: Physical environment modification versus another physical environment modification. Long-term effect: Prevalence of discomfort in neck/shoulder (Computer screen angle, high vs. low line-of-sight)



Conclusion : There is low quality evidence that there is no significant difference at short-term follow-up (1 trial; 37 people) or at long-term follow-up (1 study, 137 people) in the prevalence of neck pain for those who received one workplace intervention versus those who received another workplace intervention.

DISCUSSION

The objective of this review was to determine the effectiveness of workplace interventions in working age adults with neck pain compared to no interventions, usual care or other workplace interventions.

Summary of main results

The search strategy identified 1995 references. Ten RCTs were included (2745 workers). Two studies were rated as having low risk of bias. Most trials (N = 8) examined office workers. Only a few workers were sick-listed. Thus, workplace interventions were seldom aimed at return-to-work. For the most part, there was low quality evidence (10 trials, 2745 workers) showing no significant differences between workplace interventions and no interventions for pain prevalence or pain severity. None of the significant results for pain, in favour of workplace interventions, were sustained across different follow-up times. Only one study, with a low risk of bias, had data available on sickness absence, and provided moderate quality evidence (1 study, 415 workers) that a four-component workplace intervention was significantly more effective in reducing sick leave in the intermediate-term, but not in the short- and long-term. The negative results on sickness absence might be because only a small proportion of the workers included in the study were sick-listed.

Overall completeness and applicability of evidence

An overall result from this Cochrane review is a message of: “.. low quality evidence that there are no significant differences in the reduction of pain and sickness absence between workers with neck pain receiving workplace interventions versus those who did not receive any interventions”. How should this type of result be understood and applied? Does this document the ineffectiveness of workplace interventions, or is it a message about not yet having reliable evidence on workplace interventions for this group? To discuss this, we need to divide the message into two parts. First; “*low quality evidence*” should be regarded as inconclusive evidence, and generate a demand for high quality trials in which adequate sequence generation, allocation concealment and assessor blinding are performed, and also where more participants or events are included in the trials to reduce the wide confidence intervals and thereby the risk of random error. The problem of low power was

also a consequence of an inability to pool data across trials, due to diversity in interventions, outcomes, and follow-up times. The second part of the message: “*there are no significant differences*” opens up more interpretations. First, are the content, dose and expected responses of the workplace interventions in these ten studies adequate for reducing neck pain and sickness absence? Are the outcome measures relevant to catch the present effect, or are the relevant outcome measures used? Is the timing of the outcome assessment relevant and in accordance with expected effects? This will be discussed below.

The target of most of the interventions in the included trials was musculoskeletal body functions, with some trying to modify the physical environment. However, the specific content, duration, intensity and methodology of the interventions varied considerably. Some were single interventions, others complex combinations. There were also differences in whether the interventions were individually adjusted or standardised and/or delivered in groups. In all studies, workplace adjustment strategies were to some extent individually tailored, based either on existing knowledge or on experimental ideas. However, in most cases, educational approaches were used. It could be questioned whether education alone is enough to change behaviour. Many of the interventions in the studies did not seem to be based on cumulative traditions. Some of the tested interventions seemed to be based on hypotheses and models that were developed on an ad hoc basis, rather than on evidence that had already been published. In addition, few multi-targeted interventions were conceptualised. The use of WHO's ICF (WHO 2001) could have contributed to a conceptual frame of reference based on common terminology.

There seems to be quite a range of interventions, from studies testing a single modification to the physical environment to those having four-component interventions targeting mental and physical body functions, activities and environmental changes. Hence, when trying to conduct analyses regarding the effect of interventions on specific outcomes, most of the results were based on single studies. When the number of trials increases in future updates of this review, meta-analysis will more likely be an option.

This review shows infrequent effects in favour of the experimental group, on a few outcomes, in only some studies. However, a systematic pattern was neither found across studies nor over time, i.e. a significant effect found at one point in time was non-existent at another follow-up. This may have to do with a number of factors. The first is that studies that look at reasonably effective interventions have not yet been carried out. Another reason may be that the interventions examined in the studies included in this review were not appropriate for the goal to alleviate neck pain. This involves the methodology of interventions, intensity or duration of the means, but it may also have to do with the fact that at least some of the neck pain may have different causes than work postures or physical environmental factors, as confirmed in several studies documenting that risk factors for neck pain are also psychosocial (Aas 2011; Ariens 2000; Côté 2008; Linton 2000).

A few of these included studies have such components, but they seem to be less dominant than the ones focusing on the physical exposures. Thus, the fact that the interventions take place during a part of a work day within a small fraction of a person's life reduces the efficiency and the probable effect. Another reason might be due to the chosen follow-up times. With a short follow-up time, the effect of an intervention may be limited, since it usually takes time for affected musculoskeletal systems to recover. With a long follow-up time, the problem is that a number of other influences may occur during the follow-up time, which reduces the ability to determine if the intervention was the main or only cause of the outcome. The lack of interventions targeting the ICF-domains "attitudinal- and social environment" may also have led to the lack of effectiveness. Employers' involvement in workplace intervention programs has gradually become more important (Lambek 2010; Aas 2008), even though this is not new in the return-to-work literature (Franché 2005; Loisel 2001; Franché 2005). The lack of clinical interventions, such as cognitive therapy, combined with workplace interventions, diagnostic assessments followed by the reassurance that there was no harm in being active, and the active involvement of stakeholders might also be plausible causes for these inconclusive results. By using the psychosocial flag framework for identifying psychosocial obstacles for musculoskeletal disorders such as neck pain, the awareness of the wide spectrum of risk factors for neck pain could be strengthened in the future. Most of the included studies in this review did not include employer involvement in their intervention. Finally, another plausible reason might be that these were just chance findings, because most studies analysed several outcome measures at several follow-up moments.

The measurement of outcomes varied considerably between the ten studies. Pain, musculoskeletal discomfort, prevalence of disability, periods without symptoms or similar concepts were used in the different studies, along with sick leave and prevalence of persons recovered. No dominant or standardised methodology to measure neck pain/discomfort/symptoms and sickness absence seems to exist, and different scales for measuring subjective pain were used in the studies. The follow-up time varied considerably between the studies. No study discussed whether the interventions were expected to have long-term, intermediate- or short-term effects. The follow-up times seemed to be determined more on research procedures than on ideas about the time it would take to get effects of the interventions on pain, discomfort or sick leave.

Quality of the evidence

The GRADE-analyses revealed that these studies provided low quality evidence, which means that further research is very likely to have an important impact on the confidence in the estimate of effect, and will likely change the estimate.

As expected, blinding is a challenge in this type of research, and with the nature of these interventions, it is not possible to blind

healthcare providers or participants. One cannot avoid that their expectations may influence the effect of the interventions. However, there should not be any obstacle prohibiting blinding of the outcome assessor. Nevertheless, less than 50% of the studies provided blinded outcome evaluation. In addition, incomplete outcome data, low compliance and differences in baseline characteristics of the participants introduce a high risk of bias in several of the included studies. The number of participants in each intervention was low in several of the studies. In addition, the diversity of settings, participants and interventions hampered pooling of data and the overall robustness of the evidence gained from results that are repeated across studies.

In addition, the diversity of primary studies regarding interventions and outcomes is a typical challenge for conducting meta-analysis on workplace interventions in general (Conn 2009).

The significant result on sickness absence is promising, as the study had low risk of bias (Haukka 2008), and also used a more broad targeted four-component intervention, built on participatory ergonomics methodology, with high involvement of stakeholders. Still, these results were from a study of kitchen workers, while most workplace interventions targeting neck pain are for computer workers. This may reduce the clinical relevance and generalisability of this result.

Potential biases in the review process

There is no universally accepted definition of workplace interventions. In the present review, the main prerequisite was that the intervention was conducted at the workplace. Of course, interventions that aim to modify physical, or social and attitudinal factors in the work environment cannot be applied elsewhere. However, modification of personal factors, like exercise and other health promotion activities, may be as feasibly conducted outside the workplace. Comparison of their effectiveness across the setting, that is, within or outside the workplace, has not been applied as far as we know. Another potential bias might be caused by our inclusion criteria of studies where at least 50% of the participants had neck pain at baseline, in both the intervention and control groups. Would a review that only included studies where all or 75% of the participants had neck pain at baseline give other results? Even though some of these studies only included participants with neck pain, not all had pain at baseline, due to the fluctuating nature of neck pain.

Agreements and disagreements with other studies or reviews

The results of the symptom outcomes will be discussed first. In this review, we tried to find relief of neck pain, among workers with such pain. The prognosis for neck pain, and the effects of treatment are generally less optimistic than for low-back pain (Borghouts 1998; Carroll 2008; Côté 2008; Hill 2004). However, several risk factors related to intensive computer work, like key-

board position with small elbow angles, inadequate mouse position, high screen placement and chairs that do not have arm rest have been identified (Ariens 2000). Psychosocial factors such as high demand, low control and low support at work also influence the incidence of health problems in workplace settings (Lau 2008). Thus, one could hope that intervening against these factors would reduce neck pain. The present review indicates no strong evidence for mostly educational workplace interventions aimed at reducing these identified risk factors. However, the results should be interpreted with caution because of the small number of studies and participants included in the analysis, and because only two of the ten studies had a low risk of bias. A review conducted at the Institute for Work & Health in Canada among computer users found moderate evidence that workstation adjustments, and rest breaks together with exercise had no impact on pain symptoms, while alternative pointing devices had a positive impact (van Eerd 2006). For the rest of the different ergonomic interventions in this review (van Eerd 2006), there were inconsistent findings, or insufficient evidence. Another Cochrane review focusing on several types of MSD also found that workplace interventions failed to reduce symptoms (van Oostrom 2009). We could question whether we experience an implementation challenge with using the risk-literature directly when designing and implementing interventions in complex contexts such as the workplace. According to the PARIISH framework, successful implementation is a function of the nature and type of evidence, the qualities of the context in which the evidence is being introduced, and the way the implementation is facilitated (Kitson 2008). If the context is not ready or actively involved, we could question if workplace interventions alone are likely to result in a sustainable effect. A literature review on health effects of workplace interventions revealed a lack of reporting on how the interventions actually were implemented (Egan 2009). This might be crucial information in the future.

When discussing the results on sickness absence, it is important to have in mind that the effort of reducing sick leave was not a high priority in any of the included studies, and that few of the participants in the studies were actually sick-listed. To expect to reduce a phenomenon (e.g. sickness absence) that almost does not exist, seems demanding. Still, one of the included studies revealed a significant finding on sickness absence. Studies focusing on workplace interventions targeting sick-listed workers, often call these 'RTW-workplace interventions'. Is this the same type of workplace intervention provided in the studies in this review, but with another aim? RTW-workplace interventions have been found to significantly reduce sick leave (Franché 2005; Lambeek 2010; van Oostrom 2009). In a review of 10 studies among sick-listed employees with MSD, Franché et al (Franché 2005) found strong evidence that offers of work accommodation and early contact between healthcare providers and the workplace, and moderate evidence that early contact with the worker by the workplace, ergonomic work site visits, and the presence of a RTW-coordinator significantly improved RTW for workers with MSD and other pain-

related conditions. The determinants of sick leave are complex. Any attempt to understand them must take into account interactions between individual and environmental factors and how tasks are executed, over a large variety of occupations. Therefore, effective interventions may represent a combination of processes where the workers, employers, health professionals, and employment system must interact (Anema 2007). With the growing evidence-base supporting RTW-workplace interventions, should we question if these two types of workplace interventions should interact more, when designing efficient workplace interventions for the future? Still, many guidelines for MSD only include interventions aiming at symptom reduction, without offering recommendations for workplace interventions. Implementing effective organisational and collaborative workplace interventions for those who remain at work and in pain, will be challenging but necessary for the future.

AUTHORS' CONCLUSIONS

Implications for practice

This review neither supports nor refutes any specific workplace intervention. Therefore, whether a specific workplace intervention is likely to reduce pain or not is still unknown. Based on the current literature, there is low quality evidence that there is little or no difference in pain relief for workers with neck pain who do or do not receive workplace interventions and moderate evidence from only one trial that multi-component workplace interventions might be effective in reducing sick leave in the intermediate-term, although the effect is not sustained over time. Further research is very likely to have an important impact on our confidence in the estimate of effect, and is likely to change the estimate.

Implications for research

The large variations in target groups, interventions, follow-ups and outcome measurements restricted pooling of data across studies. Hence, there is an urgent need for randomised controlled trials with well-designed multi-dimensional interventions, tailored towards neck pain and conducted at the workplace. We recommend that researchers use the ICF terminology to ensure that all relevant dimensions of health and functioning are addressed in further trials. In addition, the two main outcomes, pain relief and reduced sickness absence/return-to-work, would benefit from standardisation, and should always be included in this types of study. Hence, there is an urgent need for randomised controlled trials with well designed intervention components tailored towards each individual and the multifactorial etiology of neck pain.

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* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

Characteristics of included studies [ordered by study ID]

Bernaards 2007

Methods	The study is a randomised controlled trial with a block-randomised design. The study had two intervention groups and one control group. To prevent unbalanced randomisation, participants were pre-stratified by company and self-reported sports participation. The intervention period lasted six months in the years of 2004-2005 and took place in the Netherlands.
Participants	<p>The participants were computer workers from head-offices of seven companies in various branches (insurance, science, energy, transportation policy and taxes). The companies were located in different regions in the Netherlands.</p> <p>The inclusion criteria were: Frequent (i.e. at least once a week) long-term pain, stiffness and tingles in neck, shoulders, arms, wrists and/or hands in the preceding six months and/or the last two weeks. Performing computer work for at least three days a week during at least three hours a day. Having a working contract until the last follow-up measurement. Not being under treatment of a doctor or (physical) therapist for complaints in the neck, shoulders, arms, wrists and/or hands. Not having non-work-related or clear somatic diseases (e.g. rheumatoid arthritis, cervical hernia, tennis elbow, carpal tunnel syndrome). Finally, having sickness absence of less than 50% of the total working time (i.e. worker was working at least 50% of the hours he or she was supposed to work according to his or her working contract).</p> <p>Excluded were women who were pregnant in the start of the study.</p> <p>A short questionnaire was sent to 8000 workers. The number of workers who responded was 1875, of which 466 met the inclusion criteria and were randomised into three groups. The intervention group 1 (work style group) had 152 participants, the intervention group 2 (work style and physical activity group) had 156 participants and the control group had 158 participants. The follow-up rate at 12 months was 68%.</p> <p>Mean age was 43.8, 43.6 and 44.4 years in the intervention group 1, intervention group 2 and control group respectively. Male sex was 54.6%, 53.8% and 58.2% respectively. Mean workdays a week were 4.5 days.</p> <p>MSD is described as symptoms in neck and upper limbs. The distribution of average pain at baseline was 4.1, 3.9 and 3.7 in intervention group 1, intervention group 2 and control group respectively on a scale from 0 'no pain' to 10 'worst pain ever'.</p> <p>Median duration of pain at baseline was 36 months, 30 months and 36 months respectively. Accordingly, prevalence of neck shoulder symptoms at baseline was 87.4%, 86.2% and 90.3% in the three groups.</p>
Interventions	<p>The intervention for the two intervention groups both consisted of six interactive group meetings of 15 to 60 minutes duration in a six-month period. Four group meetings were large (with maximally ten participants) and two group meetings were small (with maximally three participants). The goal of all group meetings was behavioural change with regard to physical activity and/or work style. All group meetings took place at the workplace during work time under the supervision of a specially trained counsellor. The counsellors used standardised protocols.</p> <p><i>Intervention group 1: Work style group.</i> The goal of the intervention was to stimulate work place adjustment and to improve body posture, the number and quality of breaks, and coping behaviour with regard to high work demands.</p>

	<i>Intervention group 2: Work style and physical activity group.</i> In the combined intervention the additional goal was to increase moderate to heavy intensity physical activities, in addition to the interventions presented above. Performing physical exercise was not part of the intervention itself. <i>Control group:</i> The control group did not attend any of the group meetings, no intervention was given.	
Outcomes	<p>All outcomes except degree of recovery, were measured at baseline (October 2004). In addition, all outcomes were measured at six months follow-up (April 2005) and twelve months follow-up (October 2005). The primary outcomes were:</p> <p><i>Recovery:</i> Degree of recovery from neck and upper limb symptoms was assessed using a seven-point Visual Analogue Scale ranging from 'much worse' to 'completely recovered'.</p> <p><i>Pain intensity:</i> Current pain, average pain and worst pain in the past four weeks were assessed using a validated eleven-points numerical scale ranging from 0 'no pain' to 10 'worst pain ever'.</p> <p><i>Disability at work:</i> Change in ability to work in the past four weeks was assessed with a validated eleven-point scale ranging from 0 'no change' to 10 'extreme change'.</p> <p><i>Number of days with neck and upper limb symptoms:</i> Participants reported the number of days with neck/shoulder symptoms and arm/wrist/hand symptoms in the past six months (no symptoms, 1-7 days, 8-30 days, 31-90 days, 91-180 days) and the past week (no symptoms, 1 day, 2-3 days, 4-7 days) using the validated Dutch Musculoskeletal Questionnaire.</p> <p><i>Number of months without symptoms:</i> The number of months without neck and upper limb symptoms in the past six months was assessed using one question: "In how many of the past six months did you have no symptoms in neck and upper extremities?"</p>	
Notes	<p>Additional information about the trial was found in two other publications (Bernaards 2006; Bernaards 2008).</p> <p>First author was contacted for missing information and responded.</p>	
<i>Risk of bias</i>		
Item	Authors' judgement	Description
Adequate sequence generation?	Yes	<p>Quote: "An independent statistician prepared the randomisation by using a computer-generated randomisation.... Furthermore, block randomisation with blocks of three was used".</p> <p>According to the first author, the generated sequences were like 123, 213, 321 etc, where number 1 was referring to group 1, 2 was referring group 2, and 3 was referring to group 3. The numbers were put in envelopes in this order. The first participants was given the first envelope, the second participant was given the second envelope etc. To conclude, this is an adequate method computer-generated block randomisation.</p>

Bernaards 2007 (Continued)

Allocation concealment?	Yes	Information about treatment allocation was kept in envelopes. The researchers were not aware of numbers inside the envelopes. After baseline measurements, the researchers opened the envelopes and informed the workers about group allocation. Some workers were informed about their treatment allocation by phone. This was the case when the participants were unable to collect their number themselves. The envelopes were opened during the call. The description above is based on information from the article and information given by author. To conclude, it is our impression that the allocation was adequately concealed.
Blinding? All outcomes - participants?	No	Quote: "Unfortunate, it was impossible to blind participants and counsellors for the treatment allocation". Blinding of participants to the intervention was not performed.
Blinding? All outcomes - providers?	No	Blinding of care providers to the intervention was not performed either.
Blinding? All outcomes - outcome assessors?	Yes	The researchers who performed the follow-up were not aware of the treatment allocation of participants, except for the counsellors who also performed part of the measurements. According to the author the counsellors could have known treatment allocation for less than 10% of the participants. Since the outcomes assessors were blinded in more than 90% of the cases, we score 'yes' here.
Incomplete outcome data addressed? All outcomes - drop-outs?	No	The drop-out rate at 12 months follow-up was 32 %, which is considered to be too high.
Incomplete outcome data addressed? All outcomes - ITT analysis?	Yes	Quote. "Intention- to-treat analyses were used to estimate the effect of the intervention. This means that all participants who were randomly assigned to one of the two intervention groups, were included in the analyses regardless of whether they attended the group meetings".

Bernaards 2007 (Continued)

		Intention-to-treat analyses were performed.
Free of selective reporting?	Yes	All outcomes are reported thoroughly. There is no reason to suspect selective outcome reporting.
Similarity of baseline characteristics?	Yes	According to table 1 in the article, the baseline characteristics of the participants were largely similar in all three study groups.
Co-interventions avoided or similar?	Yes	According to author all companies were instructed not to start any co-interventions during the intervention period. If there were co-interventions by means of discussions between the groups, they were similar in index groups and control group.
Compliance acceptable?	No	The main part of the intervention was attending group meetings. Compliance to the group meetings is reported in table 2 in the article in form of number of participants who attended the six meetings. Even though the compliance was quite similar in the two intervention groups, it was not high (less than 50% attended the meetings). Hence, compliance was not acceptable.
Timing outcome assessments similar?	Yes	All groups were assessed simultaneously at baseline, 6 months and 12 months follow-up.

Fostervold 2006

Methods	The study is a randomised controlled trial with two interventions groups. A stratified randomisation procedure was used, where gender and age were regarded as potentially important prognostic factors and used as strata. The study was conducted in The National Insurance Services in Norway in 1999.
Participants	The participants were recruited from employees at The National Insurance Services in Oslo, Norway. To be included in the study, the participants had to be between 18 and 62 years old and working between 70% and 100% of normal hours. Excluded were employees with known illness, planning to leave job or planning pregnancy. In total 150 employees out of 500 were selected. There were 75 participants in each group. All participants were experienced video display unit (VDU) users and used VDU above 50% of their working time. Thirteen workers left the study, giving a dropout rate of 9%.

	<p>Mean age was 41.1 years and 40.8 years in intervention group 1 and intervention group 2 respectively. Hundred and eleven female workers and 39 male workers participated in the study. Sex distribution was 55 females in intervention group 1 and 56 females in intervention group 2.</p> <p>MSD was assessed by a symptom questionnaire measuring 14 different symptoms. Prevalence of discomfort in neck and shoulder at baseline was 75% and 73.5% in intervention group 1 and 2 respectively.</p>	
Interventions	<p>The intervention was installation of a new desktop with a submerged VDU screen into the table top. The computer screen was lowered and tilted backwards in two different angles.</p> <p>Intervention group 1 had a high line of sight (HLS) $\alpha = -15^\circ$, which means a line of sight 15° lower than a horizontal line.</p> <p>Intervention group 2 had downward line of sight (DLS) $\alpha = -30^\circ$, which means a line of sight 30° lower than a horizontal line.</p>	
Outcomes	<p>The following outcomes were measured at baseline and after 12 months:</p> <p><i>Subjective symptoms:</i> A symptom questionnaire developed in-house assessing 14 different symptoms was used. The symptoms were: Focusing difficulties, headache, discomfort in the neck and shoulder, discomfort in the back, discomfort in the arm, discomfort of the leg, skin symptoms, dizziness, nausea, concentration problems, general feeling of fatigue, discomfort in eyes, tired eyes, and reading problems. Each symptom was assessed by seven items. The first one categorical, determining whether or not the participant had experienced symptoms during the last three weeks. The remaining items were intensity and duration of that symptom. This was assessed on a seven-step numeric scale with semantic descriptors at both ends and in the middle.</p> <p><i>Health examination (included number of days absent due to illness during last six months)</i> : The examination comprised the following health indicators: Musculoskeletal tender or trigger points, neck mobility, presence of and intensity of any pain during neck movements, isometric/endurance test, palpation of tendon attachments, mobility in the shoulder joint and symptoms of carpal-tunnel syndrome. In addition a structured clinical interview identified these issues: Known disease, prescribed medication, use of painkillers, received physiotherapeutic or chiropractic treatment, smoking, height, weight, number of days absent due to illness during last six months, and number of work days absent due to musculoskeletal problems in previous six months.</p> <p><i>Optometric status:</i> This outcome was assessed by measuring refraction, contrast sensitivity, and the zone of clear single vision.</p> <p><i>Musculoskeletal load:</i> EMG (electrode electromyography) was used to measure muscle activity of neck and shoulder area.</p> <p><i>Control measures:</i> Individual psychological states, satisfaction with the physical work environment and perceived work strain were measured to control for potential confounding factors. Control measurements of lighting, screen distance, and working hours in front of the VDU, were also recorded.</p>	
Notes	First author was contacted for missing information and responded.	
<i>Risk of bias</i>		
Item	Authors' judgement	Description

Fostervold 2006 (Continued)

Adequate sequence generation?	Yes	According to first author it was used a between subjects design between units and a stratified design within each unit. Stratifying factors were gender and age. Block randomisation with a block size of four was used as randomisation procedure between units. A simple stratified lottery technique was used as assignment procedure. Drawing of lots is an adequate method of randomisation.
Allocation concealment?	Yes	After recruitment each participant was allocated a case number comprising individual identification number and unit identification number. The people carrying out the assignment procedure did not conduct the number allocation. Neither were they part of the recruitment process. Information about the case number, age and gender were then handed over to the staff conducting the randomisation procedure. All this according to first author. This is an adequate method of allocation concealment.
Blinding? All outcomes - participants?	No	It was impossible to blind the worker.
Blinding? All outcomes - providers?	No	It was also impossible to blind the care provider to the intervention.
Blinding? All outcomes - outcome assessors?	No	The study contained measures like self-assessed questionnaire, optometric examination, health examination and musculoskeletal load. According to author, outcome assessors were blinded to the intervention except for measures of musculoskeletal load. Without all measurements blinded, it is not possible to score 'yes'.
Incomplete outcome data addressed? All outcomes - drop-outs?	Yes	In total 9% of the participants dropped out of the study. They were evenly distributed between the groups. This is an acceptable drop-out rate.
Incomplete outcome data addressed? All outcomes - ITT analysis?	Yes	Author has confirmed that all randomised participants were analysed in the group to which they were allocated.

Fostervold 2006 (Continued)

Free of selective reporting?	Yes	All outcomes are reported thoroughly. Based on an overall impression, 'yes' is scored.
Similarity of baseline characteristics?	Yes	Stratified randomisation was performed to ensure equally distribution of gender and age. Author provided information about sex distribution between the groups. The groups were similar at baseline regarding the important indicators; age and sex.
Co-interventions avoided or similar?	Yes	Co-interventions were avoided according to author.
Compliance acceptable?	Yes	Due to the nature of the interventions, the participants in both groups had to comply when doing computer work.
Timing outcome assessments similar?	Yes	Author has confirmed that the timing of the outcomes assessments was similar in both groups.

Haukka 2008

Methods	<p>The study is a cluster-randomised trial consisting of two groups. Randomisation was carried out using an assignment algorithm called Alternate Ranks Design (ARD) and stratification by area (city district) and type of kitchen (school, nursery, home for senior citizens, other institution).</p> <p>The study was conducted in different institution-based kitchens in four large cities in Finland in the years 2002-2005. The duration of the intervention was 11 to 14 months.</p>
Participants	<p>Out of 202 eligible municipal kitchens, 80 kitchens refused to participate either collectively or based on individual workers refusal. Thus, 122 kitchens were randomised to intervention group and control group. However three kitchens dropped out. Of the remaining 119 kitchens, the intervention group consisted of 59 kitchens and the control of 60 kitchens. The total number of workers was 504 (263 in intervention group, 241 in control group).</p> <p>Inclusion criteria were having at least three full-time workers in each kitchen and employees working for at least six hours per day. Exclusion criteria are not stated.</p> <p>There were different kinds of kitchens: School (intervention group 43, control group 42), nursery (intervention group 10, control group 11), nursing home (intervention group 5, control group 6), and other (intervention group 1, control group 1). The workers were food service managers, chefs, cooks, kitchen aids and others.</p> <p>Distribution of female sex was 96% and 98% in the intervention group and control group respectively. Accordingly, range of age (median) was 19-63 (46) years and 19-62 (47) years. Distribution of full time work was 95% and 97% in the two groups respectively.</p> <p>Prevalence of neck pain at baseline was 71%.</p>

Interventions	<i>Intervention group:</i> The intervention was carried out in a participatory way based on active group work. The workers were actors identifying problems, planning and evaluating changes, and implementing them in collaboration with management and technical staff. The researcher acted as a consultant and trainer, promoting, guiding, and training the workers during the development work and taking care of progress of the implementation of changes. Regular meetings were held to standardise the working methods of the teams. In addition, a project coordinator participated in the workshops, observed the working of the researchers, and provided them with feedback. The intervention phase was composed of a 2-month pre-implementation phase and a 9-12-month implementation phase. In the pre-implementation phase all workers participated in a two days (10 hours) workshop where they initially were taught basic principles of ergonomics and the functions of musculoskeletal system. In the second workshop every kitchen decided on their primary targets to improve ergonomics and planned the implementation. In the implementation phase ergonomics changes were carried out, promoted by 18 hours of workshops. Each of the three workshops had a specific thematic element related to ergonomics, and the process of intervention was thoroughly discussed. <i>Control group:</i> In the control kitchens normal activity was going on. No intervention was given.	
Outcomes	<p>All measurements were collected by a questionnaire at baseline and every three months during the intervention (3, 6, 9 and 12 months), and post intervention measures were taken at 3, 6, 9 and 12 months. In all, measurements were collected nine times. The outcomes were:</p> <p><i>Prevalence of musculoskeletal pain (included prevalence of neck pain):</i> This outcome was measured in seven anatomical sites (neck, shoulders, forearms/hands, low back, hips, knees and ankles/feet).</p> <p><i>Trouble caused by pain during the past three months:</i> This outcome was measured ranging from 1 (not at all), to 7 (very much).</p> <p><i>Local fatigue after the work day during the past seven days:</i> Was measured on a scale from 1 (not at all) to 6 (very much).</p> <p><i>Prevalence of musculoskeletal sick leave during past three months:</i> This outcome was measured as 'yes' or 'no'.</p> <p><i>Changes in perceived physical workload:</i> Was measured ranging from 1 (not at all) to 7 (very strenuous).</p> <p><i>Prevalence of stress:</i> Psychosocial factors such as stress was measured during the past month ranging from 1 (no stress at all) to 3 (much stress).</p> <p><i>Mental strenuousness at work:</i> Was measured ranging from 1 (not at all) to 3 (very strenuous).</p> <p><i>Job satisfaction:</i> Was measured as 1 (satisfied), 2 (undecided) and 3 (dissatisfied).</p>	
Notes	Additional information about the study was found in two other publications (Haukka 2006 ; Pekkonen 2009). First author was contacted and gave us missing information.	
<i>Risk of bias</i>		
Item	Authors' judgement	Description

Adequate sequence generation?	Yes	Quote: "Randomisation was carried out using an assignment algorithm (Alternate Ranks Design (ARD) and stratification by area (city district) and type of kitchen (school, nursery, home for senior citizens, other institution). Kitchens in each stratum were ranked in descending order by number of staff. A person not otherwise involved in the study during the field phase performed the randomisation". This is an adequate method of avoiding selection bias.
Allocation concealment?	Yes	Concealment of allocation is not reported. When asked, first author informs that the person who carried out the randomisation and assignment to the study arms, was an independent person with no information about the persons included in the trial and no influence on the assignment sequence or on the decision about eligibility of the participant. This is an adequate method of concealed allocation.
Blinding? All outcomes - participants?	No	Participants were not blinded to the intervention.
Blinding? All outcomes - providers?	No	Care providers were not blinded to the intervention.
Blinding? All outcomes - outcome assessors?	Yes	Data were collected from the participants by questionnaire. The researchers were blinded in the following respect: they had no access to the questionnaire data during the data collection, and data analysis was started only after the whole follow-up data was collected.
Incomplete outcome data addressed? All outcomes - drop-outs?	Yes	At 12 months follow-up 82 out of 504 participants had dropped out. This gives a drop out rate of 16%, which is acceptable.
Incomplete outcome data addressed? All outcomes - ITT analysis?	Yes	All kitchens were analysed into the group they were allocated, except three kitchens that dropped out. We consider this situation analogous to the case in which the patients dies before starting the medication/treatment, This is not generally considered

Haukka 2008 (Continued)

		as a situation that destroys the intention-to-treat principle. The amount of dropouts were minor in relation to the total number of kitchens and does not threaten the comparability of the groups.
Free of selective reporting?	Yes	There is no reason to suspect selective outcome reporting.
Similarity of baseline characteristics?	Yes	According to table 1 in the article the groups were similar at baseline regarding important indicators.
Co-interventions avoided or similar?	Yes	“All the participants were asked not to talk about the study process in case they changed kitchen. Only two workers were transformed from an intervention to a control kitchen during the intervention, so that contamination was probably minor”. In addition, it was a cluster randomised trial with participants from the two arms of the study working at separate locations.
Compliance acceptable?	Yes	Quote: “On average 73% of the workers participated in the workshops”. Based on this, we think that the compliance was acceptable.
Timing outcome assessments similar?	Yes	According to table 2 in the article, the timing of the outcome assessment was similar in both groups.

Hedge 1999

Methods	The study is a randomised controlled trial consisting of two groups. The study was conducted in a large office building in Phoenix, USA in 1995. The intervention period lasted three weeks.
Participants	Recruitment of participants is not reported, however 46 participants were included in the study. By the end of the study eight participants had either moved their work location or moved to another company. Thus, only 38 participants were left at three weeks follow-up. Inclusion criterion was being a full time office employee. Exclusion criteria are not stated. All participants were working by computer. They were engineers constructing Boeing airplanes. The participant's age ranged from 24 to 57 years, with a mean age of 37.4 years. Seventy-four percent of the participants were female. The average amount of time using computer each day was 5.4 hours. The Intervention group had 23 participants, the same as the control group.

Hedge 1999 (Continued)

	Neck pain prevalence at baseline 70% and 54% in the intervention group and control group respectively.	
Interventions	<i>Intervention group:</i> The intervention consisted of using a downward tilted computer keyboard on a tray. <i>Control group:</i> The control group used a conventional keyboard placed on a flat keyboard tray.	
Outcomes	<p>All outcomes were measured at baseline and after three weeks.</p> <p><i>Physical dimensions of the workstation:</i> This outcome was measured (home/row height; distance from the floor to the top of the home row keys; keyboard slope angle of the keyboard at the home row, measured with an inclinometer; seat pan height; distance from the floor to the lower edge of the seat pan fabric; monitor distance; distance from the centre of the monitor to the eyes when sitting in front of the computer with fingers on the home row keys). Presence of wrist rest and/or foot rest (yes/no) was noted.</p> <p><i>VDU work:</i> The participants were asked for the following information: Job tenure (months); daily VDT use (hours); mouse use (never, occasionally, fairly often, very often); frequency of data entry (never, occasionally, fairly often, very often); use of wrist rest (yes/no); use of foot rest (yes/no). Participants were asked about their knowledge of ergonomics (none, a little, moderate, very knowledgeable, expert).</p> <p><i>Workstation comfort:</i> Was measured using a self-report questionnaire on physical comfort of keyboard use, mouse use and chair comfort (very uncomfortable, fairly uncomfortable, fairly comfortable, very comfortable).</p> <p><i>Musculoskeletal discomfort (included prevalence of neck pain):</i> Was measured with a self-reported, not validated questionnaire that was developed in-house. This questionnaire asked participants to rate discomfort in all body regions on the following scales: frequency of ache, pain, discomfort (never, 1 - 2 times last week, 3 - 4 times last week, once every day, several times every day); intensity of ache, pain, discomfort (slightly uncomfortable, moderately uncomfortable, very uncomfortable); ache, pain, discomfort interference with work (not at all, slightly interfered, substantially).</p>	
Notes	First author was contacted for missing information and responded.	
<i>Risk of bias</i>		
Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Quote: "Pretest measures were taken for all subjects after which they were randomly assigned to either a control or a test group". When asked, first author informs that there was a list with names of participants giving each participant a number. Randomisation was performed by selecting numbers from an opaque bag of labels. This method is in principle the same as drawing of lots, which is an acceptable method of randomisation.

Hedge 1999 (Continued)

Allocation concealment?	No	Concealment of allocation is not reported. When asked, author could not verify adequate concealment.
Blinding? All outcomes - participants?	No	The participants were not blinded to the intervention.
Blinding? All outcomes - providers?	No	The care providers were not blinded to the intervention.
Blinding? All outcomes - outcome assessors?	Yes	When asked, author informs that the participants completed their own surveys and placed them into sealed envelopes. Other outcomes were collected online without influence of outcomes assessor. To conclude, outcome assessors were blinded to the intervention.
Incomplete outcome data addressed? All outcomes - drop-outs?	No	The dropout rate varied in the two groups. All eight participants who dropped out came from the control group, giving a dropout rate of 35 % in this group, which is unacceptable in a three weeks intervention period. To conclude, the drop out rate was too high for such a short intervention period.
Incomplete outcome data addressed? All outcomes - ITT analysis?	No	Intention-to-treat is not reported. When asked, author informs that the eight participants that dropped out, were excluded from analyses. Hence, intention-to-treat is not accomplished.
Free of selective reporting?	Yes	There is no reason to suspect selective outcome reporting.
Similarity of baseline characteristics?	Yes	Baseline data such as sex- and age distribution of the two groups are missing. According to the memory of author, there were no significant differences between the groups at baseline regarding important indicators.
Co-interventions avoided or similar?	Yes	According to author no other interventions occurred at the time of the study.
Compliance acceptable?	Yes	Due to the nature of the intervention; downward tilted keyboard on tray, the participants had to comply in order to do their

Hedge 1999 (Continued)

		jobs.
Timing outcome assessments similar?	Yes	The timing of outcome assessments was similar in both groups.

Horneij 2001

Methods	The study is a randomised controlled trial consisting of three groups. The study was conducted in five municipal home-care services in a medium sized city in southern Sweden in the year 1996-1997. The follow-up period was 18 months.
Participants	<p>Female nursing aides and assistant nurses working in the home-care service were invited to participate in the study. In all, 659 women were invited to participate and 534 (81%) accepted. Due to recourses available, only 282 participants were randomised into the three groups. Intervention group 1 had 93 participants, intervention group 2 had 99 participants and the control group had 99 participants. Only 169 participants completed follow-up at both 12 and 18 months.</p> <p>The inclusion criteria were Swedish speaking, permanently employed, female nursing aides and assistants working at least 50% of full time, not pregnant and not suffering from intercurrent disease. Mean age was 45, 43 and 44 years in intervention group 1, intervention group 2 and control group respectively. Prevalence of neck pain during the preceding year was 54 to 61%. Sick leave due to neck, shoulder and/or back pain during the last year was reported by 13% of the participants.</p>
Interventions	<p><i>Intervention group 1 - Stress Management Programme in Groups (SM):</i> The purpose of this intervention was primarily to identify and reach goals and strategies for perceived stress induced by lack of social support, low decision latitude/work control, and perceived high psychological work load. The intervention was based on group instruction. Each group consisted of participants from one work place. In all, 12 groups were involved. Every group met 7 times over a period of 7 weeks, each time for 1.5 hours. Two follow-ups were carried out after about 3 and 6 months. The meetings covered both theory and practice. An important part involved interactive talks among the participants concerning their experience of stress in general and at work, and how to handle these problems. At the seventh meeting a stress-reducing goal for the entire workplace was formulated by the participants. The aim was to fulfil the goal within the follow-up 3 months later. Furthermore, the participants formulated an individual goal in order to reduce perceived stress at work and/or at home. The goal was to be concrete and attainable within 6 months. The immediate supervisors were invited to join the sixth or/and the seventh meeting if the participants agreed.</p> <p><i>Intervention group 2 - Individual Physical Training Programme (IT):</i> The participants underwent initially a clinical physical examination. In connection with this examination all participants received an individually designed training programme. The exercises were individually adapted and individual goals were formulated. The majority of the exercises were taken from a manual specially designed for this purpose. The participants were asked to take notes every time they did their exercises and every time they exercised for more than 20 minutes and perceived the training "somewhat hard".</p> <p><i>Control group - The Non-Intervention Group:</i> This group was to function as a check for environmental changes during the follow-up period. Participants were requested to live</p>

	as usual. If, however, the physical examination indicated a condition which could risk the participant's further health, e.g. increased blood pressure or severe musculoskeletal disorders, she was recommended to contact a physician.	
Outcomes	<p>The following measurements were conducted at baseline, and at 12 and 18 months follow-up:</p> <p><i>Musculoskeletal pain:</i> Neck, shoulder and back symptoms were assessed using the Nordic Musculoskeletal Questionnaire (NMQ). The response options were 'yes' and 'no'.</p> <p><i>Perception of pain during the previous 6 months:</i> This outcome had 5 scores: Much better, better, same, worse, much worse.</p> <p><i>Perceived interference with work and/or leisure activities due to discomfort:</i> Those who in NMQ had indicated pain the neck/shoulders and/or back were asked to rate how much these problems had interfered with work and/or leisure activities. Rating was done on a 100mm visual analogue scale. Changes from baseline to follow-up above 10mm were considered as a change.</p> <p><i>Pain-drawing:</i> The extension of pain during the previous month was described on a pain-drawing. The extension of pain was evaluated by the sum of areas marked. The neck/shoulder region was covered by 12 areas.</p> <p><i>Perceived physical exertion at work:</i> This outcome was measured on a Borg scale. The question asked was: "How physically demanding do you in general perceive your work to be?" The rating was from 6 to 20, where 6 meant 'less than very, very easy' and 20 meant 'more than very, very hard'.</p> <p><i>Perceived work-related psychosocial factors:</i> This outcome was assessed with the questionnaire developed by Rubenowitz comprising five psychosocial factors, namely 1) Influence on and control over work, 2) Supervisor climate, 3) Stimulation from work itself, 4) Relations with fellow workers, and 5) Psychological workload. Each factor comprised five items and each item had five responses, where 1 meant 'very unsatisfactory' and 5 meant 'entirely satisfactorily'.</p> <p><i>Physical activities and fitness training the previous 6 months:</i> A question about physical exercise from Wiktorin was modified: "To what extent have you performed physical activities of fitness training during the previous six months?" The scores were rated from 1 to 8, where 1 meant 'no exercise, and very little physical activity' and 8 meant 'hard physical exercise with vigorous exertion and training/competition at top level'.</p> <p>The following outcome was measured at 12 and 18 months follow-up:</p> <p><i>Perceived amount of training:</i> This outcome reported to what extent the participants had performed any training during the last 6 months compared with previously.</p> <p>The following outcome was only measured at 18 months follow-up:</p> <p><i>Question about applied relaxation and home exercise:</i> At 18 month the participants were asked to what extent they had performed any relaxation and home exercises during the preceding 6 months.</p>	
Notes	<p>Since physical activity is an intervention outside the scope of this review, we disregard this intervention in analyses.</p> <p>First author was contacted for missing information and responded.</p>	
Risk of bias		
Item	Authors' judgement	Description

Horneij 2001 (Continued)

Adequate sequence generation?	Yes	According to first author the randomisation was made by computer in two steps: In step one randomisation was done at group level to one of the three interventions to avoid co-interventions within each of the five home-care units. This was possible as each caring unit comprised several work places and each work-place had its own leader. In step two randomisation was made on individual level in order to decide which participants should be included. To conclude, generation by computer is an adequate method of randomisation.
Allocation concealment?	Unclear	Author could not confirm adequate concealment of allocation.
Blinding? All outcomes - participants?	No	It was not possible to blind the workers in this type of interventions.
Blinding? All outcomes - providers?	No	Care providers could not be blinded to the intervention.
Blinding? All outcomes - outcome assessors?	Yes	Quote: "The questionnaires were administered by the project nurse, who was not involved in the intervention programmes, and blinded to group allocation". Outcome assessor was blinded to group allocation.
Incomplete outcome data addressed? All outcomes - drop-outs?	No	Out of 282 participants, 169 completed all follow-ups. This gives a drop-out rate of 40%, which is not acceptable.
Incomplete outcome data addressed? All outcomes - ITT analysis?	Yes	Author confirms that all randomised participants were analysed in the group to which they were allocated.
Free of selective reporting?	Yes	Since all outcomes are reported, the article appears to be without selective reporting.
Similarity of baseline characteristics?	Yes	Quote: "There were no differences between the groups at baseline for any demographic or outcome variable". The groups were similar at baseline.
Co-interventions avoided or similar?	Yes	Quote: "To avoid interference bias between the programmes, the randomisa-

Horneij 2001 (Continued)

		<p>tion comprised two steps: (1) all work places at each unit were randomised to one of three groups (...). 2) Individuals were randomly assigned from their designated workplaces".</p> <p>Measurements were taken to avoid co-interventions within each unit. Treatment outside the study might have occurred, but was most likely similar in all groups.</p>
Compliance acceptable?	Yes	<p>Quote: "Besides the first examination, the IT programme included four sessions and the SM programme seven sessions and two follow-ups. Only six participants of the IT group and nine participants of the SM group attended fewer than 50% of the sessions".</p> <p>Since the groups consisted of 90 and 93 participants respectively, this is considered to be good compliance to the intervention.</p>
Timing outcome assessments similar?	Yes	<p>Outcomes were evaluated at simultaneously in all groups.</p>

Kamwendo 1991

Methods	<p>The study claims to be a controlled trial with randomly assigned participants. The study had two intervention groups and one control group. The intervention period lasted four weeks and follow-up was conducted after six months. The study took place in Sweden. The year the study was conducted is not stated, but it must have been before 1991 when the article was published.</p>
Participants	<p>Medical secretaries were invited to be part of the study. The setting was a hospital where both interventions and follow-up took place. The secretaries' major tasks were typing patient journals, letters and reports, in addition to telephone, mail an appointment duties.</p> <p>Inclusion criteria were having experienced some pain in either the neck or shoulder region during the previous year, and having estimated their average time of sitting during working hours to be a minimum of five hours daily. In addition, the inclusion criteria were having worked at least 30 hours a week and not being under medical treatment for their neck and shoulder problems.</p> <p>From a study of 420 medical secretaries, 119 fulfilled the initial inclusion criteria. After further screening 40 secretaries were excluded for different reasons, hence 79 secretaries were included in this trial. The participants were all females and the mean age was 39.4. They had worked as secretaries for an average of 9.6 years and 73% of them worked full time. The number of participants was 25, 28 and 26 in the intervention group 1, intervention group 2 and control group respectively. Three secretaries went on maternity leave during the study period and thus 76 remained at six months follow-up.</p>

	There is no information about how pain was defined in the selection of participants. During the previous year 63% of the 420 secretaries had experienced neck pain. Of the sample of 119 participants all had experienced some pain in the neck or the shoulder region during the previous year.
Interventions	<p><i>Intervention group 1: Traditional neck school.</i> Participants in this group attended a four-hour traditional neck school conducted by a therapist. Lectures were given twice weekly during working hours and consisted of a series of slides which included anatomy, aetiology of musculoskeletal disorders, ergonomics and self-care measures. Part of each lecture was used to pause-gymnastics in form of exercises using the neck and shoulder followed by relaxation. In addition, ergonomics of the workplace was demonstrated.</p> <p><i>Intervention group 2: Reinforced neck school.</i> In addition to the above described neck school, the participants in this group received a variety of measures to enhance compliance. The participants were visited by a therapist at the workplace. Ergonomic adjustments were discussed. They were also interviewed by a psychologist on psychosocial and organizational factors. The total additional time allotted to this group was two hours per individual. Other methods to enhance compliance in this group were: 1) Only measures that the participants agreed upon were included in their individual program. 2) The participants received written information for a pause-gymnastics program. 3) A written list of all measures agreed upon was given to the participants. 4) Participants were contacted for a follow-up after three months.</p> <p><i>Control group:</i> The control group was not offered any intervention until after completion of all follow-up assessments.</p>
Outcomes	<p>Measurements were made baseline, after the four-week intervention period and at six months follow-up. The outcomes were:</p> <p><i>Expectancy:</i> Four questions were used to measure expected outcome. The questions asked were how relevant the program was, whether it could be recommended to others, and how successful it might be for neck and shoulder, as well as for back pain. Each question had a ten-point scale ranging from 1 'not at all relevant' to 10 'very relevant'.</p> <p><i>Ergonomic knowledge:</i> A multiple choice questionnaire was constructed with 13 questions (range 0-49 points) covering the neck school material. This test was applied in both intervention groups before and after neck-school. The control group did not receive the test.</p> <p><i>Fatigue and pain:</i> Daily ratings of muscular neck and shoulder fatigue and pain was carried out at work for a five days period. Ratings were conducted three or four times a day. A ten cm Visual Analogue Scale anchored by 'no pain' to 'considerable pain' was used.</p> <p><i>Work load:</i> Estimated workload was rated daily using ten cm Visual Analogue Scale anchored by 'usually little to do' to 'unusually much to do'.</p> <p><i>Range of motion:</i> Active range of motion was measured at pre-, post-, and follow-up periods, according to American Academy of Orthopedic Surgeons recommendations by means of a Myrin goniometer.</p> <p><i>Headache and low back pain:</i> This was rated at pre-, post, and follow-up periods using a ten cm Visual Analogue Scale anchored by 'no pain' to 'considerable pain'.</p> <p><i>Sickness absence:</i> Information about sick leaves was obtained from the Swedish Social Insurance Agency. Diagnoses, number of sick leave occasions, and number of days on sick leave were registered.</p> <p><i>Interview information at follow-up:</i> Number of ergonomic changes the participants had</p>

Kamwendo 1991 (Continued)

	implemented at work, number of pieces of equipment acquired, and number of visits to a physician, therapist or chiropractor for neck and shoulder pain or headache after the four week programme were registered. Adherence to individual programs for intervention group B was also registered.	
Notes	Additional information about the study was found in another publication (Kamwendo 1991B). First author was contacted for missing information, but could not respond our questions, since the study is rather old.	
<i>Risk of bias</i>		
Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Quote:“The subjects were randomly assigned to a control group or one of two interventions groups.” No details are given on how the randomisation procedure was performed. First author was contacted for clarification, but could not respond, since the study is rather old. We think that the method of randomisation most likely was adequate, but the information available is limited.
Allocation concealment?	Unclear	No information is given on allocation concealment in the article or provided by author on request.
Blinding? All outcomes - participants?	No	No detailed information is given, but it is not likely that the participants could be blinded to the intervention.
Blinding? All outcomes - providers?	No	No detailed information is given, but it is not likely that the care providers could be blinded to the intervention.
Blinding? All outcomes - outcome assessors?	Unclear	The outcome assessor may have been blinded, but it is not clear in the text if the research team and the intervention team were separate.
Incomplete outcome data addressed? All outcomes - drop-outs?	Unclear	Even though 76 out of 79 participants remained in the study at the end, it is quite uncertain that there is data for all the 76 individuals regarding the main outcome variable.

Kamwendo 1991 (Continued)

Incomplete outcome data addressed? All outcomes - ITT analysis?	Unclear	Intention-to-treat analyses are not reported. Author could not clarify this matter.
Free of selective reporting?	Yes	No selective reporting is suspected in this article.
Similarity of baseline characteristics?	Unclear	No information comparing the three groups at baseline is given.
Co-interventions avoided or similar?	Yes	No information is given on co-interventions, but it seems unlikely.
Compliance acceptable?	Yes	Quote: "Consequently, the failure of this study to demonstrate a decrease in neck or shoulder discomfort did not occur as a result of poor compliance, rather despite good compliance". Attendance to neck school was 100% in intervention group 1 and 98% in intervention group 2, which is very acceptable.
Timing outcome assessments similar?	Yes	The timing of the outcomes was the same for all three groups.

Ketola 2002

Methods	The study is a randomised controlled design with a block-randomised design having two intervention groups and one control group. The study was conducted in three administrative units in a medium-sized city in Finland in 1998-1999. The administrative units were used as stratum for the block randomisation, which was done on an individual level. The duration of follow-up period was ten months.
Participants	The employees were mainly secretaries, technicians, architects, engineers and draftspeople, all working at video display units. The inclusion criteria were symptoms in the neck, shoulders, or upper-limb in one to eight anatomical areas, out of eleven areas all together, during the preceding 30 days. In addition, the inclusion criteria were computer work for more than four hours per week, mouse use for more than 5% of the work time and age under 61 years. A number of 515 employees were asked to fill out a questionnaire, of which 416 employees returned the formulae. One hundred and twenty-four participants met the inclusion criteria and were randomised into three groups, however only 109 participants were left at baseline. At ten months follow-up there were 102 participants left. Intervention group 1: Intensive, (N=39), had 60% women, with a mean age of 46 years. Intervention group 2: Education, (N=35), had 60% women and a mean age of 49 years. The control group, (N= 35), had 54% women and a mean age of 49 years. MSD was described as symptoms in the neck, shoulders, or upper-limb region in one to eight anatomical areas during the preceding 30 days. The prevalence of neck pain at

	baseline was 78%, 77% and 77% in the three groups respectively.
Interventions	<p>All participants were given a one-page leaflet on musculoskeletal health in association with computer work.</p> <p><i>Intervention group 1: Intensive ergonomics.</i> Physiotherapists visited the work site of every member of the intensive ergonomics group. They introduced an ergonomic checklist for computer work. The checklist emphasised the following three items: the layout and environmental conditions of the workroom, adjustments of the workstation, and breaks during work. The participants independently assessed their workstations with the aid of the list and answered the questions. Adjustments and alterations in the existing furniture and work equipment were performed. The worker was also encouraged to participate actively in the redesign and rearrangement of his or her workstation. New forearm and wrist rests were available if needed. In addition, the participants were advised to pay attention to their work postures and to add short pauses into their work. The ergonomic evaluation and the implementation of the immediate changes for a workstation took approximately 1.5-2 hours.</p> <p><i>Intervention group 2: Ergonomic education.</i> The participants attended a 1-hour training session in ergonomics in groups of two to six persons. A trainer in ergonomics instructed the workers concerning the principles of ergonomics in computer work. They received the same checklist as the intensive ergonomics group and were encouraged to evaluate their own workstation, implement changes, and ask for new equipment and furniture if needed. Moreover, the participants were instructed to add short pauses and adopt relaxed work postures.</p> <p><i>Control group:</i> The group received no intervention, except for the one-page leaflet.</p>
Outcomes	<p>Measurements were taken at baseline, at two months follow-up and at ten months follow-up, for the outcomes called diary of discomfort, musculoskeletal strain and pain, and level of ergonomics. The outcome called workload was only measured at baseline.</p> <p><i>Musculoskeletal discomfort:</i> The participants were asked to keep a diary of discomfort three times a day. The diary consisted of questions of discomfort in different anatomical areas. The rating had a five-point scale from 1 'feel good' to 5 'feel very uncomfortable'.</p> <p>A manikin (modified from Nordic Questionnaire) was used to define anatomical areas.</p> <p><i>Musculoskeletal strain and pain (included current pain):</i> Strain after a usual workday during the preceding 30 days was assessed by a five-point scale ranging from 1 'no strain' to 5 'very much strain'. The questions of pain during the preceding 30 days addressed the number of days with pain. The answers were classified into 'no pain' (0 day) and 'pain' (>1 days).</p> <p><i>Level of ergonomics:</i> This was measured by use of video recordings of the participants performing their daily tasks. A continuous four minutes extract of each participant was chosen to represent the person's most common computer tasks. Two researchers analysed these extracts and gave them an overall ergonomic rating from 4 'poor' to 10 'excellent' using a scale from the Finnish educational system.</p> <p><i>Workload:</i> For the assessment of the amount of daily work load, daily computer usage in minutes was calculated. This was done by using a special software program monitoring key board and mouse usage continuously.</p>
Notes	First author was contacted and filled in missing information.
Risk of bias	

Ketola 2002 (Continued)

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	According to first author randomisation was performed using a computer program. Using a computer random number generator is an adequate method of randomisation.
Allocation concealment?	Unclear	Allocation concealment is not reported. When asked, author could not verify that allocation was adequately concealed.
Blinding? All outcomes - participants?	No	Participants could not be blinded to the intervention.
Blinding? All outcomes - providers?	No	Care providers could not be blinded to the intervention.
Blinding? All outcomes - outcome assessors?	Yes	Quote: "Data on workplace layout and dimensions were collected before the intervention and also 2 and 10 months after it by two experts in ergonomics. They were blinded to the group assignment of study subjects". Outcome assessors were blinded to the intervention.
Incomplete outcome data addressed? All outcomes - drop-outs?	Yes	Out of 109 participants at baseline, 102 were left at ten months follow-up. This gives a drop-out rate of 6% which is very acceptable.
Incomplete outcome data addressed? All outcomes - ITT analysis?	Yes	Author confirms that all randomised participants were analysed in the group to which they were allocated..
Free of selective reporting?	Yes	There is no reason to suspect selective outcome reporting.
Similarity of baseline characteristics?	Yes	Quote: "The strength of our study was that all three groups were comparable as regards to demographic characteristics and occupational factors measured at the beginning of the study". According to table 1, the groups were largely similar at baseline.

Ketola 2002 (Continued)

Co-interventions avoided or similar?	Yes	Quote: "On the other hand it was practically impossible to prevent personal interaction between the groups" (...). "Ten subjects in the intensive group, seven in the education group, and eight in the reference group contacted the occupational therapist to get ergonomic advice during the 10-month follow-up". Co-interventions were not avoided, but were similar in all groups.
Compliance acceptable?	Unclear	Compliance is not reported in the article. When asked, author could not verify acceptable compliance.
Timing outcome assessments similar?	Yes	The timing of the outcome assessment was similar in all groups.

Morken 2002a

Methods	The study is designed as a cluster-randomised controlled trial consisting of three intervention groups and two control groups. One control group (group B) was not randomised. The study was performed for a period of 16 months, from 1998-2000 in eight aluminium plants in Norway.
Participants	For intervention group 1, 2, 3 and control group A, the inclusion criterion was workers who could shift groups of operators in the production line. Exclusion criterion was other functions/types of jobs. The excluded participants constituted control group B. All employees in the eight aluminium plants were recruited by participating in the baseline survey, where 92% (N=5654) filled out the questionnaire satisfactorily. Among them 67% were operators, 20% were office workers and 8% were managers. Mean age was 40 years with a range from 18-69 years. Eighty-six per cent were men and 14% were women. Mean duration of employment at the plant was 16 years. Of those completing the post intervention questionnaire (N=5143, 94% of all workers), 3321 participants were so-called matched individuals with completed questionnaire in 1998 and 2000. Of those matched participants, 837 were operators in the production line which were randomised on group level to three intervention groups and control group A. The rest (N= 1344) constituted control group B. A number of 414 participants received the intervention. In intervention group 1 operators and supervisors participated (20 shift groups, N=132). In intervention group 2 operators only participated (18 shift groups, N=135). In intervention group 3, two groups of supervisors and managers and ten groups of operators participated (N= 147). A total number of 423 workers from the production line were in control group A. At 16 months follow-up there were 2181 participants left. The production line was chosen for intervention due to high prevalence of MSD, well-known risk factors and similar and comparable job content. Work in the production line was physically demanding. At baseline 94 had experienced pain in one of more of body parts the last 12 months (range 87-95%). The prevalence of participants with neck pain was 68%.

Morken 2002a (Continued)

Interventions	<p><i>The intervention groups:</i> The intervention was developed specifically for the needs of the aluminium industry. The intervention was similar in the three intervention groups. The reason for three groups receiving the same intervention was to examine the potential differing results according to who participated in the process; the operators and their supervisors (group 1), the operators only (group 2) or the managers and supervisors only (group 3). The company physiotherapists were the providers of the intervention, which included ten meetings aimed at coping with MSD at the workplace. Important components were learning by conversation and acting within the context of the environment. Each session had different topics. They lasted 2 hours; 1 hour and 15 minutes of didactics about knowledge from the topics and 45 minutes of discussion about solutions of work environment problems. Changes in the working environment were implemented after the sessions.</p> <p><i>The control groups:</i> The control groups did not receive any special attention or information.</p>	
Outcomes	<p>Measurements were made at baseline (1998) and 16 months after, with the following three main outcomes:</p> <p><i>Musculoskeletal symptoms (included musculoskeletal discomfort):</i> The prevalence of musculoskeletal symptoms was assessed using Standard Nordic Questionnaire (SNQ) with modifications. Musculoskeletal symptoms were described as pain, discomfort or reduced mobility. The body parts examined were neck, shoulders, elbows, hands, upper neck, lower back, hips, knees and feet. Furthermore, the body part “head” was specially added to the bodily items. A five-point scale (from ‘never’ to ‘very often’, instead of ‘yes’ and ‘no’) was used.</p> <p><i>Coping with musculoskeletal symptoms:</i> An index of eleven coping strategy items was used. The questions concerned what the participants did when they experienced troublesome bodily pain or stiffness. The index had a three-point scale ranging from 1 ‘seldom or never’ to 3 ‘often’. The eleven scores were summarised to one score.</p> <p><i>Psychosocial work factors:</i> A job content questionnaire (JCQ) was used to test psychosocial work factors such as job demands, job control and social support. It was a short Swedish version of the questionnaire, which was translated to Norwegian. The questionnaire consisted of 17 questions scored on a four-point scale.</p>	
Notes	<p>The project was initiated by the involved companies and funded by them. The planners, providers and assessors were having the same employer as the participants in the study. Additional information about the trial was found in two other publications (Morken 2000; Morken 2002b).</p> <p>First author was contacted for missing information and responded.</p>	
<i>Risk of bias</i>		
Item	Authors’ judgement	Description
Adequate sequence generation?	Yes	Quote: “All the shift groups were randomised at the group level into three types of intervention groups or control group A”. According to first author randomisation was performed by drawing of lots, which is an adequate method of randomisation.

Morken 2002a (Continued)

		However, control group B was not randomised. Despite this we score 'yes' since we are disregarding control group B in further analyses.
Allocation concealment?	Yes	According to author the allocation to the different groups was performed prior to the intervention by researchers who did not know the workers in the aluminium plants. The researchers had no knowledge of the health condition or work conditions in the different shifts. In other words, they had no possibility to lead the shifts into groups that "fitted". Based on information from author, even if some details are lacking, we choose to consider the allocation adequately concealed.
Blinding? All outcomes - participants?	No	It was not possible to blind the intervention to the participants.
Blinding? All outcomes - providers?	No	Companies' physiotherapists, planned the study, developed the program, and provided the intervention. Hence, the personnel were not blinded.
Blinding? All outcomes - outcome assessors?	No	Quote: "Physiotherapists from the occupational health services distributed and collected the questionnaires in special meetings at the plants". Outcome assessors were most likely not blinded.
Incomplete outcome data addressed? All outcomes - drop-outs?	Yes	Quote: "Many of the respondents were lost due to the matching procedure when matching the data of the pre-intervention and the post-intervention survey". A number of 804 participants were lost to follow-up, of which 713 were lost due problems with the matching procedure. This represents a drop-out rate of 32- 39%, which is too high. However, additional analyses demonstrated that the lack of data from unmatched participants did not introduce any major bias. Hence, the score is 'yes'.

Morken 2002a (Continued)

Incomplete outcome data addressed? All outcomes - ITT analysis?	Yes	Information provided by author confirms that all randomised participants were analysed in the group to which they were allocated.
Free of selective reporting?	Yes	The results are reported and the findings were not in favour of the intervention. Based on an overall impression we score 'yes' here.
Similarity of baseline characteristics?	Yes	Control group B had a significant higher control and coping at baseline. They also had higher age, and more years of experience. However, since we are disregarding control group B we score 'yes' here.
Co-interventions avoided or similar?	Yes	Possible co-interventions were similar in index groups and control groups.
Compliance acceptable?	Yes	Quote: "The participation in the session for each groups varied from 70% to 100%". Compliance was acceptable.
Timing outcome assessments similar?	Yes	Author has confirmed that the timing of the outcome assessment was similar in all groups.

van den Heuvel 2003

Methods	The study is a randomised controlled trial using a cluster-randomised design. The study had two intervention groups and one control group. Randomisation was done on group level using a spreadsheet program. The duration of the intervention period was eight weeks. The study took place in the Netherlands. The year the study was conducted is not known, however it had to be before 2003.
Participants	The participants were computer workers from a large office organisation dealing with social security allowances. Twenty-two office locations were included. Inclusion criteria were working at least four days a week, having computer work at least five hours a day, and having their own computer at work. Other inclusion criteria were having complaints in neck, shoulders, arms, wrists, hands and fingers, having current pain neck/upper extremities lasting more than 14 days, considering the complaints work-related, and finally having age between 18-50 years. Workers needing medical treatment according to judgement by physician were excluded. Also excluded were workers having other health problems, including medication that might influence behaviour at work. The number of employees requested to answer a short questionnaire was 12000. A total number of 1700 workers returned the questionnaire, of which 1000 workers were included in the study. The number of participants who returned the consent form and

	<p>were randomised into groups was 268 participants, of which 219 participants completed the observation period and returned the final questionnaire.</p> <p>In intervention group 1 - <i>Breaks group</i> (N=97), the mean age was 39 years, and there were 46 % males. In the interventions group 2 - <i>Breaks and exercise group</i> (N=81), the mean age was 42 years, and there were 66 % males. In the control group (N=90), the mean age was 37 year, and 43 % were males.</p> <p>MSD is described as self-reported frequency and severity of pain in defined upper extremity regions (neck, shoulders, upper arms, forearms, wrists, hands and fingers). All groups had complaints about neck pain at baseline. According to information from author the prevalence of cumulative neck pain last week was 100%.</p>
Interventions	<p>Ergonomics of the workplace was checked before the intervention for all three groups and if necessary individually adjusted. In addition, all groups received a small booklet with general information on neck and upper limb disorders, as well as a neck and upper-limb disorder risk test.</p> <p><i>Intervention group 1: Breaks.</i> Rest breaks were introduced by a computer program (five minutes rest every 35 minutes and seven seconds rest every five minutes of computer use). The computer was blocked during the breaks.</p> <p><i>Intervention group 2: Breaks + exercises.</i> This group received the same procedure of rest breaks as the other intervention group. In addition, they received four physical exercises of 45 seconds duration.</p> <p><i>Control group:</i> Intervention was given in form of ergonomic adjustments of the work place and the receiving of the booklet was given. Besides that, no extra intervention was given.</p>
Outcomes	<p>Measurements were made three weeks before the intervention period and again after three months.</p> <p>The primary outcome was:</p> <p><i>Overall recovery from complaints.</i> This was measured with a questionnaire with a seven-point scale from 'complete recovery' to 'worse than ever before'.</p> <p>The secondary outcomes were :</p> <p><i>Frequency and severity of complaints:</i> The frequency of complaints were measured by asking how often they felt discomfort or pain in their neck, shoulders, upper arms, elbows, forearms, wrists and hands or fingers during the previous week. The alternatives were 'no pain', '1 day', '2-3 days' or '4-7 days'. The severity of complaints was measured by asking the participants to rate it on a ten-point scale from 1 'no complaints' to 10 'sever complaints'.</p> <p><i>Sick leave:</i> This was measured with a questionnaire where the participants were asked if they had been on sick leave as a result of their complaints during the last three months.</p> <p><i>Productivity:</i> This outcome was measured as mean number of computer key strokes a day. Accuracy rate was computed using this equation: Accuracy rate = 1- (number of backspace + delete key strokes) / total number of key strokes. Computer usage was recorded online.</p>
Notes	<p>Since physical exercises are outside the scope of this review, we disregard this intervention in analyses.</p> <p>First and second author was contacted for missing information, but could not be reached in this phase of the review process.</p>

<i>Risk of bias</i>		
Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Quote: "A randomisation procedure in a spreadsheet program was used that randomly assigned each location on a figure between 1 and 3". This is an adequate method of cluster randomisation.
Allocation concealment?	No	Since no information about concealment of allocation is given in the article, we have no reason to believe that concealment was performed adequately. Neither first nor second author could be reached to clarify this matter in this phase of the process.
Blinding? All outcomes - participants?	No	As the intervention consisted of breaks or breaks and exercise versus no intervention, blinding of participants was not possible.
Blinding? All outcomes - providers?	No	Blinding of care providers being in contact with the participants is not described. However, care providers could not have been blinded when performing adjustments of the workplace.
Blinding? All outcomes - outcome assessors?	No	The outcome assessor is not stated, nor his/hers blinding status. However, we assume if the outcome assessors were blinded, it would have been reported. Neither first nor second author could be reached to clarify this matter.
Incomplete outcome data addressed? All outcomes - drop-outs?	Yes	Out of 268 participants at baseline, 219 completed the study at three months follow-up. This gives a drop-out rate of 18%, which is acceptable.
Incomplete outcome data addressed? All outcomes - ITT analysis?	Yes	Even though performing an intention-to-treat analysis is not stated explicitly, we score 'yes' here since no changes of participants between groups were done in the analyses.
Free of selective reporting?	Yes	Since all outcomes were reported, there is no reason to suspect selective outcome re-

van den Heuvel 2003 (Continued)

		porting.
Similarity of baseline characteristics?	No	Intervention group 2 had 66% men, compared to 43% and 46% for control group and intervention group 1 respectively. Hence, all the groups were not similar at baseline.
Co-interventions avoided or similar?	Yes	Possible co-interventions are not reported. However, there is reason to believe that possible co-interventions would have been similar in all groups.
Compliance acceptable?	Yes	Quote: According to the answers in the general questionnaire, 74% of the participants performed the exercises most of the time. According to the questions posed after each rest break; all the exercises were performed in 78% of all rest breaks...". Compliance to exercises (intervention group 2) was fairly good. When it comes to compliance to rest breaks (intervention group 1), the computer was blocked during breaks, hence compliance for this group is assumed to have been better. To conclude, compliance was acceptable in all groups.
Timing outcome assessments similar?	Yes	All groups were assessed simultaneously.

Voerman 2007

Methods	The study is a randomised controlled trial using a block-randomisation design consisting of two groups. Both groups received an intervention. The intervention period lasted for four weeks. The study was performed in the years 2003 to 2005 in the Netherlands (area of Enschede) and in Sweden area of Goteborg.
Participants	Computer workers like job counsellors and medical secretaries were approached by telephone and announcements, and sent a screening questionnaire. To be included in the study the participants had to work at least 20 hours a week and have had perpetuating work-related complaints in the neck and/or shoulder region for at least 30 days during the last year. Excluded were participants who reported pain in more than three body regions, who suffered from severe arthrosis or joint disorders, who were using muscle relaxants, or if they reported other complaints in the upper extremity not related to computer work. The participants were all female workers over 45 years old. Mean age was 52 years in intervention group 1 (N=42) and 50.7 years in the intervention group 2 (N=37). Mean working hours per week was 32.8 in both groups. Participants were recruited between March 2003 and June 2005. Total number of par-

	<p>participants recruited is not stated, but 79 workers met the inclusion criteria, of which 65 participants completed the study at six months follow-up. Forty-one participants were recruited in Sweden, while the remaining 38 participants were recruited in the Netherlands.</p> <p>MSD was assessed as pain in neck, shoulder and upper back for at least 30 days during last year. The amount of participants with complaints and trouble in neck last year (measured from baseline) was 92.9% in the intervention group 1 and 91.9% in the intervention group 2.</p>
Interventions	<p><i>Intervention group 1: Myofeedback and ergonomic counselling.</i> The participants received ambulant myo-feedback training combined with ergonomic counselling. Immediately after baseline, participants were given a myo-feedback device and they were explained the working mechanism and background of the myo-feedback training. They were instructed to respond to the feedback by relaxation. The participants wore the device for four weeks, for at least eight hours a week, (distributed over two hours a day and two days a week as a minimum), while performing their regular work. During the weekly visits by their therapist the electronic data from last week were scrutinized and discussed to give the participants insight in their relaxation patterns and to identify possible situations of concern. The content of ergonomic counselling intervention is described below.</p> <p><i>Intervention group 2: Ergonomic counselling.</i> Participants received four weeks of intervention during which they kept a diary of activities and pain intensity scores. In this period they were visited weekly by their therapist. The first visit comprised an ergonomic workplace investigation by means of the risk inventory. This checklist contained questions to evaluate work tasks, working hours, work load, work station, and working methods. Based on the outcome, possible improvements were discussed with the participants. With regard to the work station, the focus was primarily on modifying the existing work station rather than providing new equipment. The remaining visits were used to further discuss the ergonomic aspects, the consequences of possible ergonomic adjustments etc. This was done according to a manual to guarantee a uniform intervention.</p>
Outcomes	<p>Measurements were performed at baseline, immediately after intervention, and at three months and six months after the intervention. The outcomes were:</p> <p><i>Pain intensity:</i> Pain intensity in the neck, shoulder (left and right), and upper back at time of the measurement was assessed by means of four Visual Analogue Scales. Participants were instructed to rate their subjectively experienced level of pain intensity at that moment for each body region. Pain intensity was scored on a ten cm scale ranging from 'no discomfort at all' to 'as much discomfort as possible'.</p> <p><i>Disability:</i> The level of subjectively experienced disability was assessed with the Pain Disability Index, a self-rating scale that measures the impact of pain on the abilities to participate in life activities. Disability was scored on an eleven-point scale ranging from 'not disabled' to 'fully disabled'.</p>
Notes	<p>Additional information about the Swedish branch of the study was found in another publication (Larsman 2009).</p> <p>We were able to reach the second author, who respond to our questions concerning missing information.</p>
Risk of bias	

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Quote: "Block-randomisation was used to assign subjects to either MbF or Ec. When a new group of subjects started the intervention, half of them were assigned to MbF and half of them were assigned to Ec". (MbF is intervention group 1 and Ec is intervention group 2). When asked, second author informs that randomisation was performed using a random function in Excel. Using a computer random number generator is an adequate method of sequence generation.
Allocation concealment?	Unclear	Despite thorough explanation from second author, we are not convinced that the allocation was adequately concealed in the Dutch branch of the study.
Blinding? All outcomes - participants?	No	Quote: "The character of the intervention made blinding of the therapists and the subjects to the intervention impractical. To prevent from information bias, subjects were informed that the aim of the study was to compare the effects of two interventions and that there was no evidence favouring one of these interventions". Participants were not blinded to the intervention.
Blinding? All outcomes - providers?	No	Care providers were not blinded to the intervention.
Blinding? All outcomes - outcome assessors?	No	When asked, the second author confirms that in Sweden the outcome assessors never met the participants. However, in the Dutch branch of the study the outcome assessor and care provider was the same person. Hence, all outcome assessors were not blinded to the intervention.
Incomplete outcome data addressed? All outcomes - drop-outs?	Yes	According to diagram 1 in the article, 79 participants were included in the study and 65 participants completed the study at six months follow-up. This gives a drop-out rate of 18%, which is acceptable.

Voerman 2007 (Continued)

Incomplete outcome data addressed? All outcomes - ITT analysis?	Yes	According to second author all randomised participants were analysed in the group to which they were allocated.
Free of selective reporting?	Yes	All outcomes are reported thoroughly. Besides, both groups were given an occupational intervention and no differences were found between the groups. Hence, there is no reason to suspect selective reporting.
Similarity of baseline characteristics?	Yes	Quote: "Despite extensive standardisation, the recruitment of subjects in two different study groups (Sweden and the Netherlands) resulted in heterogeneity of the subject populations with regard to age, working hours, seniority, and working posture. To correct for this, the factor study group was considered a confounder need to control for during analyses". Since the baseline imbalance was corrected for in analyses, we consider this criterion to be met.
Co-interventions avoided or similar?	Yes	When asked, the second author confirms that co-interventions were equally distributed between the two intervention groups.
Compliance acceptable?	Yes	Second author writes that in intervention group 1 the participants had to wear the myo-feedback device at least eight hours a week for four weeks; in other words they had to comply. The participants in intervention group 2 were considered to comply if they took part in all weekly meetings, and all participants did so. Hence, compliance was acceptable in both groups.
Timing outcome assessments similar?	Yes	According to diagram 1 in the article, the timing of outcomes assessment was identical in the two groups.

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Aarås 1999	Method of randomisation is not reported. When asked, first author writes that every second participant was allocated to the same group as soon as the questionnaire reached the medical department. Allocation by availability of participants is not an adequate method of randomisation. Hence, the study is not an RCT.
Arnetz 2003	Excluded due to type of participants: Proportion of included in the study with neck pain below 50% at baseline. The intervention group had a 27.7% prevalence of neck pain, the control group had 20.8%.
Borghrevink 1998	Excluded due to type of participants: 25 % of the included not working (student, housewives, militaries)
Brisson 1999	Excluded due to type of participants: Proportion of included in the study with neck pain below 50%. In total the prevalence of neck pain at baseline was 12.8%.
Bultmann 2009	Excluded due to type of participants: Proportion of included in the study with neck pain below 50%. The total prevalence of neck pain at baseline was 18.6%.
Cook 2004	Excluded due to type of participants: Proportion of included in the study with neck pain below 50% at baseline. The prevalence of discomfort in intervention group was 21%. In the control group the prevalence was 18%.
DeKraker 2008	Excluded due to type of participants: Information about neck pain at baseline lacking. Main author contacted.
Greene 2005	Randomisation it not reported in the article. When asked, author writes that assignment of participants to groups occurred in an alternating fashion; one participant to the control group and the next to the interventions group. This is not an adequate method to ensure random sequence generation. In addition, author writes that a couple of participants were purposely assigned to group allocation.
Haldorsen 1998	Excluded due to lack of workplace component in the intervention. Main author contacted.
Haldorsen 2002	Excluded due to lack of workplace component in the intervention. Main author contacted.
Henning 1997	Excluded due to type of participants: Information about neck pain at baseline lacking.
Jensen 2005	Excluded due to type of participants: Proportion of included in the study with neck pain below 50% at baseline. The prevalence of neck pain varied from 26-50% within the four groups.
Li-tsang 2008	Excluded due to type of participants: Proportion of included in the study with neck pain below 50% at baseline. The intervention group had a prevalence of 18.8%, and the control group had a prevalence of 25.8%.
Meijer 2006	Excluded due to dealing with pain in upper extremities, not neck pain.
Peper 2003	Excluded due to type of participants: Information about neck pain at baseline lacking.
Rempel 2006	Excluded due to type of participants: Information about neck pain at baseline lacking. Main author contacted.

(Continued)

Skouen 2006	Excluded due to lack of workplace component in the intervention. Main author contacted.
Veiersted 2008	Excluded due to type of participants: Proportion of included in the study with neck pain below 50% at baseline. The intervention group had a prevalence of 56% (N=18), and the control group (N=20) had a prevalence of 40%.

DATA AND ANALYSES

Comparison 1. Four-component workplace intervention versus no intervention

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Short-term effect: Prevalence of neck pain	1	469	Odds Ratio (M-H, Fixed, 95% CI)	1.43 [0.95, 2.14]
2 Intermediate-term effect: Prevalence of neck pain	1	412	Odds Ratio (M-H, Fixed, 95% CI)	0.80 [0.52, 1.21]
3 Long-term effect: Prevalence of neck pain	1	295	Odds Ratio (M-H, Fixed, 95% CI)	1.13 [0.69, 1.87]
4 Short-term effect: Prevalence of musculoskeletal sick leave past 3 months	1	469	Odds Ratio (M-H, Fixed, 95% CI)	0.83 [0.52, 1.34]
5 Intermediate-term effect: Prevalence of musculoskeletal sick leave past 3 months	1	412	Odds Ratio (M-H, Fixed, 95% CI)	0.56 [0.33, 0.95]
6 Long-term effect: Prevalence of musculoskeletal sick leave past 3 months	1	295	Odds Ratio (M-H, Fixed, 95% CI)	1.28 [0.73, 2.26]

Comparison 2. Three-component workplace intervention versus no intervention

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Long-term effect: Musculoskeletal discomfort (Arm: Operators with supervisors)	1	601	Mean Difference (IV, Fixed, 95% CI)	0.12 [-0.11, 0.35]
2 Long-term effect: Musculoskeletal discomfort (Arm: Operators without supervisors)	1	599	Mean Difference (IV, Fixed, 95% CI)	0.01 [-0.21, 0.23]
3 Long-term effect: Musculoskeletal discomfort (Arm: Managers only)	1	629	Mean Difference (IV, Fixed, 95% CI)	-0.04 [-0.24, 0.16]

Comparison 3. Two-component (mental education + physical health education, relaxation & breaks) workplace intervention versus no intervention

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Intermediate-term: Current pain (Arm: Workstyle group)	1	266	Mean Difference (IV, Fixed, 95% CI)	0.30 [-0.26, 0.86]
2 Intermediate-term effect: Current pain (Arm: Workstyle+physical activity group)	1	259	Mean Difference (IV, Fixed, 95% CI)	0.20 [-0.37, 0.77]
3 Intermediate-term effect: Prevalence 0 month without symptoms (Arm: Workstyle group)	1	264	Odds Ratio (M-H, Fixed, 95% CI)	1.03 [0.64, 1.67]
4 Intermediate-term effect: Prevalence 0 month without symptoms (Arm: Workstyle+physical activity group)	1	257	Odds Ratio (M-H, Fixed, 95% CI)	1.08 [0.66, 1.76]
5 Intermediate-term effect: Prevalence 1-2 months without symptoms (Arm: Workstyle group)	1	264	Odds Ratio (M-H, Fixed, 95% CI)	1.32 [0.73, 2.41]
6 Intermediate-term effect: Prevalence 1-2 months without symptoms (Arm: Workstyle+physical activity group)	1	257	Odds Ratio (M-H, Fixed, 95% CI)	1.18 [0.64, 2.19]
7 Intermediate-term effect: Prevalence 3-6 months without symptoms (Arm: Workstyle group)	1	264	Odds Ratio (M-H, Fixed, 95% CI)	0.78 [0.46, 1.32]
8 Intermediate-term effect: Prevalence 3-6 months without symptoms (Arm: Workstyle+physical activity group)	1	257	Odds Ratio (M-H, Fixed, 95% CI)	0.80 [0.47, 1.37]
9 Long-term effect: Current pain (Arm: Workstyle group)	1	210	Mean Difference (IV, Fixed, 95% CI)	-0.20 [-0.84, 0.44]
10 Long-term effect: Current pain (Arm: Workstyle+physical activity group)	1	209	Mean Difference (IV, Fixed, 95% CI)	-0.10 [-0.73, 0.53]
11 Long-term effect: Prevalence 0 month without symptoms (Arm: Workstyle group)	1	209	Odds Ratio (M-H, Fixed, 95% CI)	0.79 [0.45, 1.39]
12 Long-term effect: Prevalence 0 month without symptoms (Arm: Workstyle+physical activity group)	1	208	Odds Ratio (M-H, Fixed, 95% CI)	0.74 [0.42, 1.30]

13 Long-term effect: Prevalence 1-2 months without symptoms (Arm: Workstyle group)	1	209	Odds Ratio (M-H, Fixed, 95% CI)	2.01 [1.00, 4.03]
14 Long-term effect: Prevalence 1-2 months without symptoms (Arm: Workstyle+physical activity group)	1	208	Odds Ratio (M-H, Fixed, 95% CI)	2.03 [1.01, 4.08]
15 Long-term effect: Prevalence 3-6 months without symptoms (Arm: Workstyle group)	1	209	Odds Ratio (M-H, Fixed, 95% CI)	0.79 [0.46, 1.38]
16 Long-term effect: Prevalence 3-6 months without symptoms (Arm: Workstyle+physical activity group)	1	208	Odds Ratio (M-H, Fixed, 95% CI)	0.84 [0.48, 1.45]

Comparison 4. Two-component workplace intervention (physical health education, relaxation & breaks + physical environment modifications) versus no intervention

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Short-term effect: Musculoskeletal discomfort in the neck (Arm: Intensive ergonomic)	1	54	Mean Difference (IV, Fixed, 95% CI)	-0.60 [-1.15, -0.05]
2 Short-term effect: Musculoskeletal discomfort in the neck (Arm: Ergonomic education)	1	57	Mean Difference (IV, Fixed, 95% CI)	-0.60 [-1.04, -0.16]
3 Intermediate-term effect: Musculoskeletal discomfort (Arm: Intensive ergonomics)	1	54	Mean Difference (IV, Fixed, 95% CI)	-0.30 [-0.85, 0.25]
4 Intermediate-term effect: Musculoskeletal discomfort (Arm: Ergonomic education)	1	57	Mean Difference (IV, Fixed, 95% CI)	-0.20 [-0.64, 0.24]

Comparison 5. Mental health education vs. no intervention

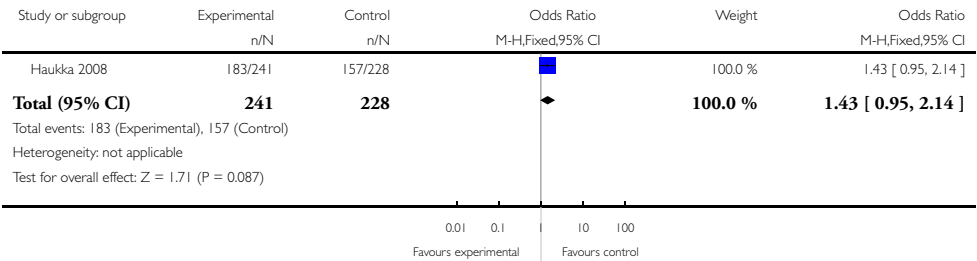
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Long-term effect: Change in pain drawing neck/shoulder	1	59	Mean Difference (IV, Fixed, 95% CI)	-0.10 [-1.39, 1.19]
2 Long-term effect: Change in interference due to neck-shoulder pain last month	1	43	Mean Difference (IV, Fixed, 95% CI)	7.70 [-13.73, 29.13]

Comparison 6. Physical environment modification versus another physical environment modification

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Short-term effect: Prevalence of neck pain (Downward-tilted vs. flat keyboard in computer work)	1	38	Odds Ratio (M-H, Fixed, 95% CI)	0.47 [0.12, 1.76]
2 Long-term effect: Prevalence of discomfort in neck/shoulder (Computer screen angle, high vs. low line-of-sight)	1	137	Odds Ratio (M-H, Fixed, 95% CI)	0.48 [0.22, 1.02]

Analysis 1.1. Comparison 1 Four-component workplace intervention versus no intervention, Outcome 1 Short-term effect: Prevalence of neck pain.

Review: Workplace interventions for neck pain in workers
Comparison: 1 Four-component workplace intervention versus no intervention
Outcome: 1 Short-term effect: Prevalence of neck pain

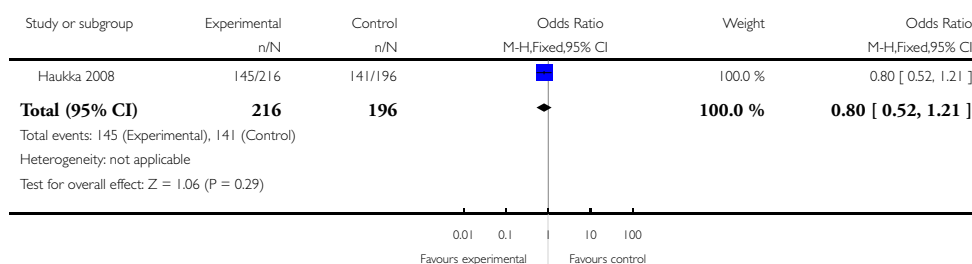


**Analysis 1.2. Comparison 1 Four-component workplace intervention versus no intervention, Outcome 2
Intermediate-term effect: Prevalence of neck pain.**

Review: Workplace interventions for neck pain in workers

Comparison: 1 Four-component workplace intervention versus no intervention

Outcome: 2 Intermediate-term effect: Prevalence of neck pain

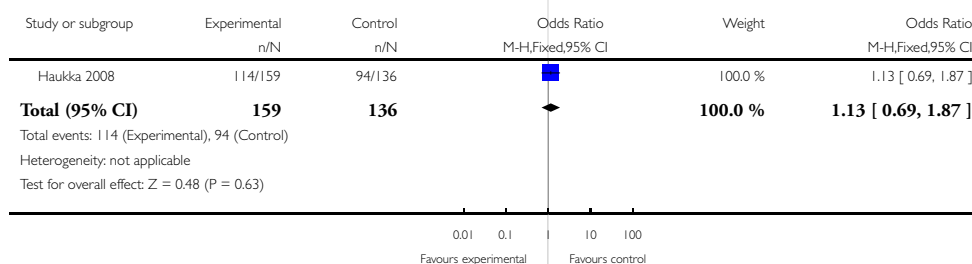


**Analysis 1.3. Comparison 1 Four-component workplace intervention versus no intervention, Outcome 3
Long-term effect: Prevalence of neck pain.**

Review: Workplace interventions for neck pain in workers

Comparison: 1 Four-component workplace intervention versus no intervention

Outcome: 3 Long-term effect: Prevalence of neck pain

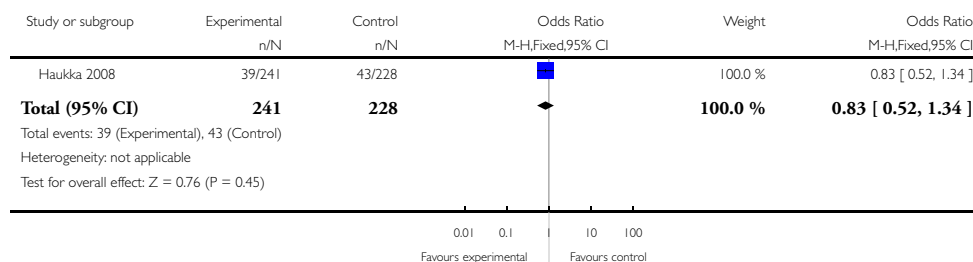


**Analysis 1.4. Comparison 1 Four-component workplace intervention versus no intervention, Outcome 4
Short-term effect: Prevalence of musculoskeletal sick leave past 3 months.**

Review: Workplace interventions for neck pain in workers

Comparison: 1 Four-component workplace intervention versus no intervention

Outcome: 4 Short-term effect: Prevalence of musculoskeletal sick leave past 3 months

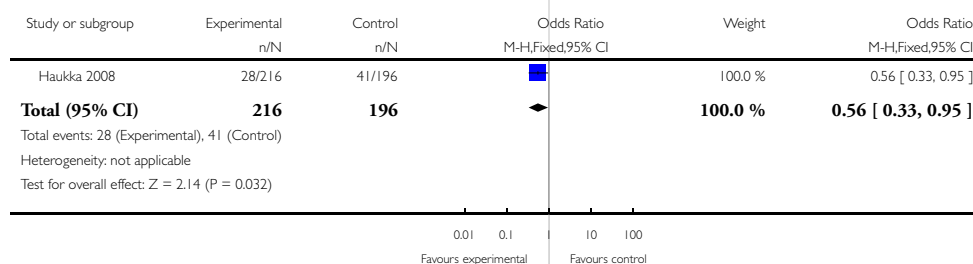


**Analysis 1.5. Comparison 1 Four-component workplace intervention versus no intervention, Outcome 5
Intermediate-term effect: Prevalence of musculoskeletal sick leave past 3 months.**

Review: Workplace interventions for neck pain in workers

Comparison: 1 Four-component workplace intervention versus no intervention

Outcome: 5 Intermediate-term effect: Prevalence of musculoskeletal sick leave past 3 months

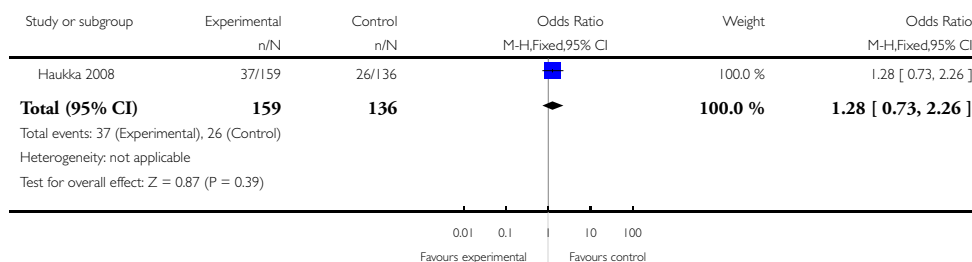


**Analysis 1.6. Comparison 1 Four-component workplace intervention versus no intervention, Outcome 6
Long-term effect: Prevalence of musculoskeletal sick leave past 3 months.**

Review: Workplace interventions for neck pain in workers

Comparison: 1 Four-component workplace intervention versus no intervention

Outcome: 6 Long-term effect: Prevalence of musculoskeletal sick leave past 3 months

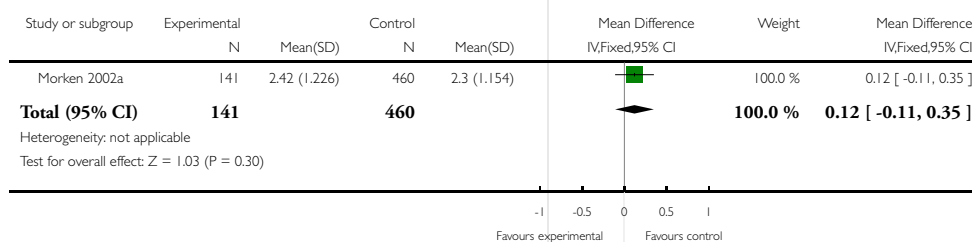


**Analysis 2.1. Comparison 2 Three-component workplace intervention versus no intervention, Outcome 1
Long-term effect: Musculoskeletal discomfort (Arm: Operators with supervisors).**

Review: Workplace interventions for neck pain in workers

Comparison: 2 Three-component workplace intervention versus no intervention

Outcome: 1 Long-term effect: Musculoskeletal discomfort (Arm: Operators with supervisors)

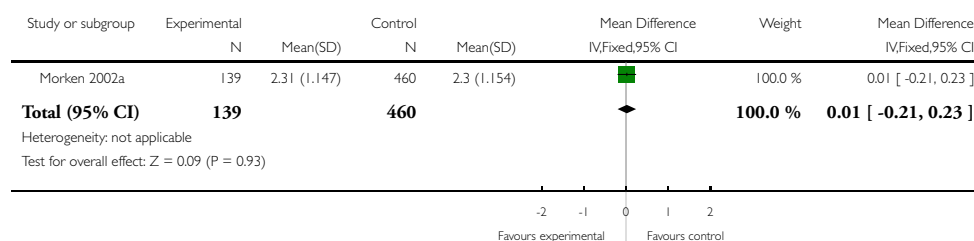


**Analysis 2.2. Comparison 2 Three-component workplace intervention versus no intervention, Outcome 2
Long-term effect: Musculoskeletal discomfort (Arm: Operators without supervisors).**

Review: Workplace interventions for neck pain in workers

Comparison: 2 Three-component workplace intervention versus no intervention

Outcome: 2 Long-term effect: Musculoskeletal discomfort (Arm: Operators without supervisors)

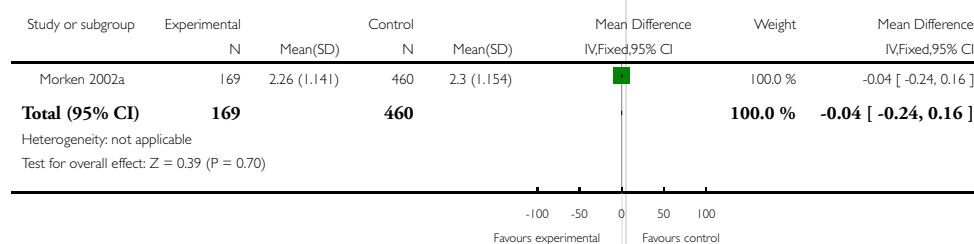


**Analysis 2.3. Comparison 2 Three-component workplace intervention versus no intervention, Outcome 3
Long-term effect: Musculoskeletal discomfort (Arm: Managers only).**

Review: Workplace interventions for neck pain in workers

Comparison: 2 Three-component workplace intervention versus no intervention

Outcome: 3 Long-term effect: Musculoskeletal discomfort (Arm: Managers only)

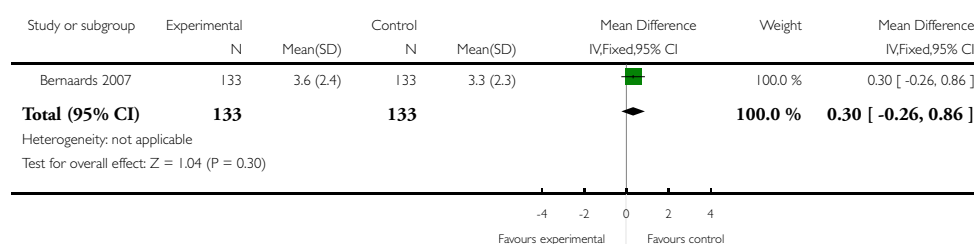


Analysis 3.1. Comparison 3 Two-component (mental education + physical health education, relaxation & breaks) workplace intervention versus no intervention, Outcome 1 Intermediate-term: Current pain (Arm: Workstyle group).

Review: Workplace interventions for neck pain in workers

Comparison: 3 Two-component (mental education + physical health education, relaxation % breaks) workplace intervention versus no intervention

Outcome: 1 Intermediate-term: Current pain (Arm: Workstyle group)

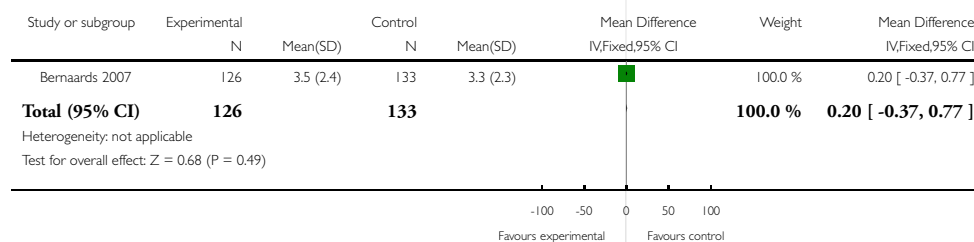


Analysis 3.2. Comparison 3 Two-component (mental education + physical health education, relaxation & breaks) workplace intervention versus no intervention, Outcome 2 Intermediate-term effect: Current pain (Arm: Workstyle+physical activity group).

Review: Workplace interventions for neck pain in workers

Comparison: 3 Two-component (mental education + physical health education, relaxation % breaks) workplace intervention versus no intervention

Outcome: 2 Intermediate-term effect: Current pain (Arm: Workstyle+physical activity group)

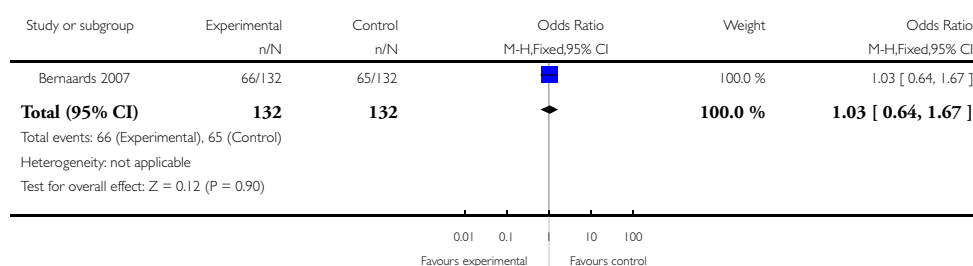


Analysis 3.3. Comparison 3 Two-component (mental education + physical health education, relaxation & breaks) workplace intervention versus no intervention, Outcome 3 Intermediate-term effect: Prevalence 0 month without symptoms (Arm: Workstyle group).

Review: Workplace interventions for neck pain in workers

Comparison: 3 Two-component (mental education + physical health education, relaxation % breaks) workplace intervention versus no intervention

Outcome: 3 Intermediate-term effect: Prevalence 0 month without symptoms (Arm: Workstyle group)

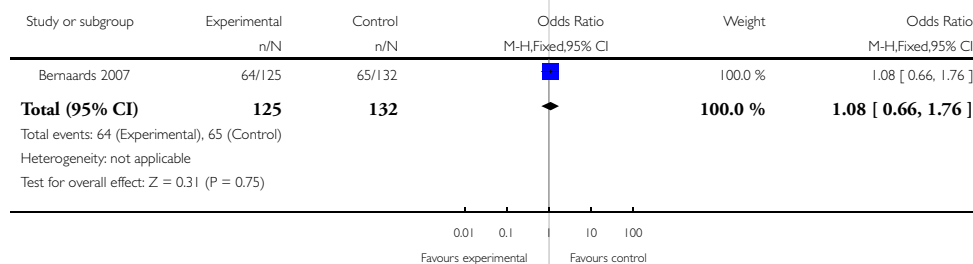


Analysis 3.4. Comparison 3 Two-component (mental education + physical health education, relaxation & breaks) workplace intervention versus no intervention, Outcome 4 Intermediate-term effect: Prevalence 0 month without symptoms (Arm: Workstyle+physical activity group).

Review: Workplace interventions for neck pain in workers

Comparison: 3 Two-component (mental education + physical health education, relaxation % breaks) workplace intervention versus no intervention

Outcome: 4 Intermediate-term effect: Prevalence 0 month without symptoms (Arm: Workstyle+physical activity group)

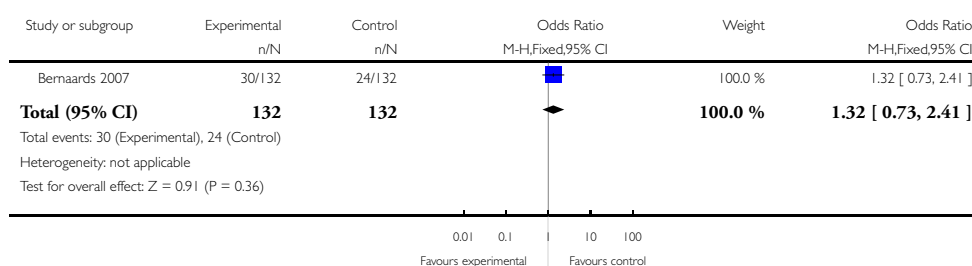


Analysis 3.5. Comparison 3 Two-component (mental education + physical health education, relaxation & breaks) workplace intervention versus no intervention, Outcome 5 Intermediate-term effect: Prevalence 1-2 months without symptoms (Arm: Workstyle group).

Review: Workplace interventions for neck pain in workers

Comparison: 3 Two-component (mental education + physical health education, relaxation % breaks) workplace intervention versus no intervention

Outcome: 5 Intermediate-term effect: Prevalence 1-2 months without symptoms (Arm: Workstyle group)

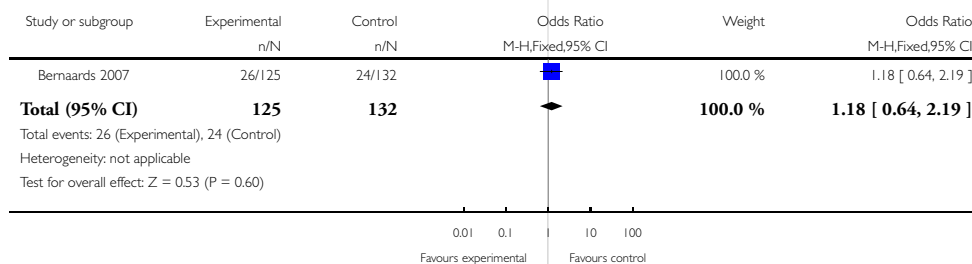


Analysis 3.6. Comparison 3 Two-component (mental education + physical health education, relaxation & breaks) workplace intervention versus no intervention, Outcome 6 Intermediate-term effect: Prevalence 1-2 months without symptoms (Arm: Workstyle+physical activity group).

Review: Workplace interventions for neck pain in workers

Comparison: 3 Two-component (mental education + physical health education, relaxation % breaks) workplace intervention versus no intervention

Outcome: 6 Intermediate-term effect: Prevalence 1-2 months without symptoms (Arm: Workstyle+physical activity group)

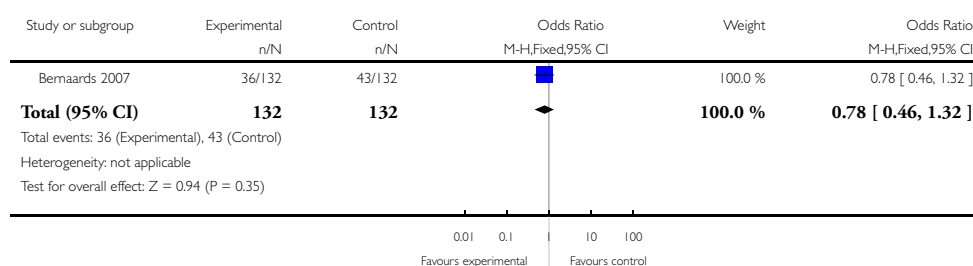


Analysis 3.7. Comparison 3 Two-component (mental education + physical health education, relaxation & breaks) workplace intervention versus no intervention, Outcome 7 Intermediate-term effect: Prevalence 3-6 months without symptoms (Arm: Workstyle group).

Review: Workplace interventions for neck pain in workers

Comparison: 3 Two-component (mental education + physical health education, relaxation % breaks) workplace intervention versus no intervention

Outcome: 7 Intermediate-term effect: Prevalence 3-6 months without symptoms (Arm: Workstyle group)

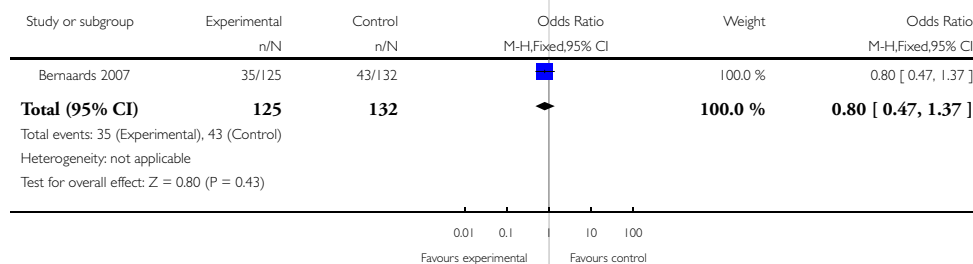


Analysis 3.8. Comparison 3 Two-component (mental education + physical health education, relaxation & breaks) workplace intervention versus no intervention, Outcome 8 Intermediate-term effect: Prevalence 3-6 months without symptoms (Arm: Workstyle+physical activity group).

Review: Workplace interventions for neck pain in workers

Comparison: 3 Two-component (mental education + physical health education, relaxation % breaks) workplace intervention versus no intervention

Outcome: 8 Intermediate-term effect: Prevalence 3-6 months without symptoms (Arm: Workstyle+physical activity group)

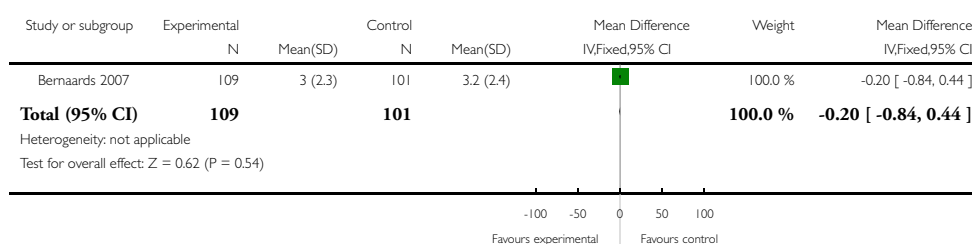


Analysis 3.9. Comparison 3 Two-component (mental education + physical health education, relaxation & breaks) workplace intervention versus no intervention, Outcome 9 Long-term effect: Current pain (Arm: Workstyle group).

Review: Workplace interventions for neck pain in workers

Comparison: 3 Two-component (mental education + physical health education, relaxation % breaks) workplace intervention versus no intervention

Outcome: 9 Long-term effect: Current pain (Arm: Workstyle group)

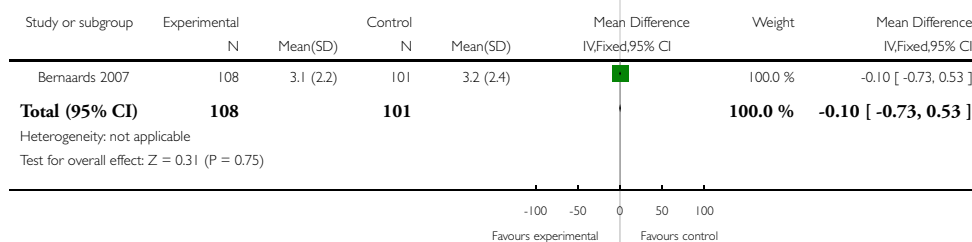


Analysis 3.10. Comparison 3 Two-component (mental education + physical health education, relaxation & breaks) workplace intervention versus no intervention, Outcome 10 Long-term effect: Current pain (Arm: Workstyle+physical activity group).

Review: Workplace interventions for neck pain in workers

Comparison: 3 Two-component (mental education + physical health education, relaxation % breaks) workplace intervention versus no intervention

Outcome: 10 Long-term effect: Current pain (Arm: Workstyle+physical activity group)

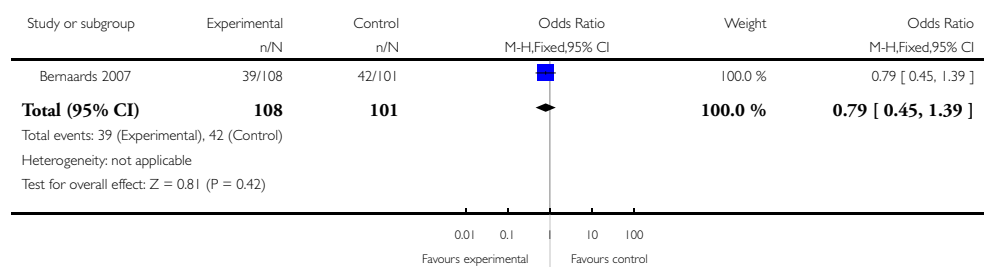


Analysis 3.11. Comparison 3 Two-component (mental education + physical health education, relaxation & breaks) workplace intervention versus no intervention, Outcome 11 Long-term effect: Prevalence 0 month without symptoms (Arm: Workstyle group).

Review: Workplace interventions for neck pain in workers

Comparison: 3 Two-component (mental education + physical health education, relaxation % breaks) workplace intervention versus no intervention

Outcome: 11 Long-term effect: Prevalence 0 month without symptoms (Arm: Workstyle group)

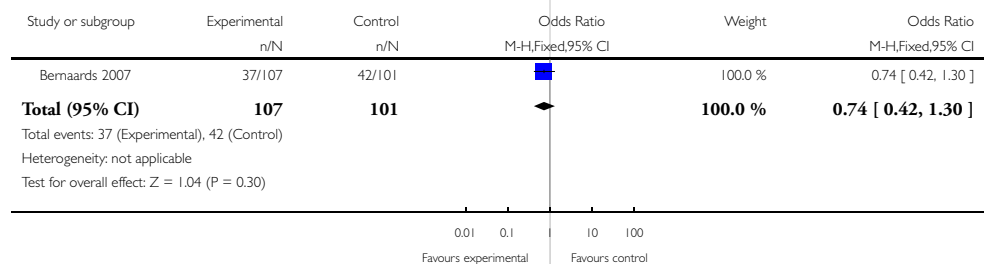


Analysis 3.12. Comparison 3 Two-component (mental education + physical health education, relaxation & breaks) workplace intervention versus no intervention, Outcome 12 Long-term effect: Prevalence 0 month without symptoms (Arm: Workstyle+physical activity group).

Review: Workplace interventions for neck pain in workers

Comparison: 3 Two-component (mental education + physical health education, relaxation % breaks) workplace intervention versus no intervention

Outcome: 12 Long-term effect: Prevalence 0 month without symptoms (Arm: Workstyle+physical activity group)

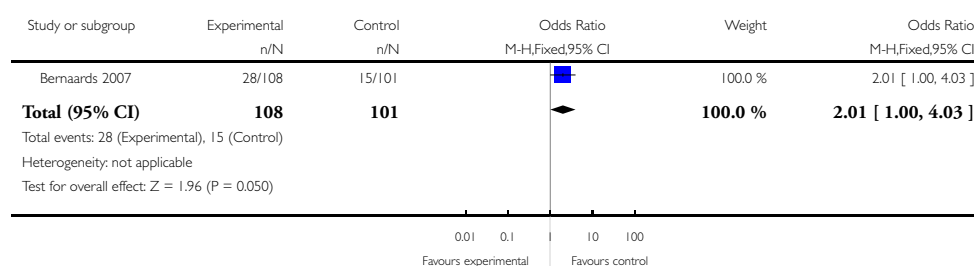


Analysis 3.13. Comparison 3 Two-component (mental education + physical health education, relaxation & breaks) workplace intervention versus no intervention, Outcome 13 Long-term effect: Prevalence 1-2 months without symptoms (Arm: Workstyle group).

Review: Workplace interventions for neck pain in workers

Comparison: 3 Two-component (mental education + physical health education, relaxation % breaks) workplace intervention versus no intervention

Outcome: 13 Long-term effect: Prevalence 1-2 months without symptoms (Arm: Workstyle group)

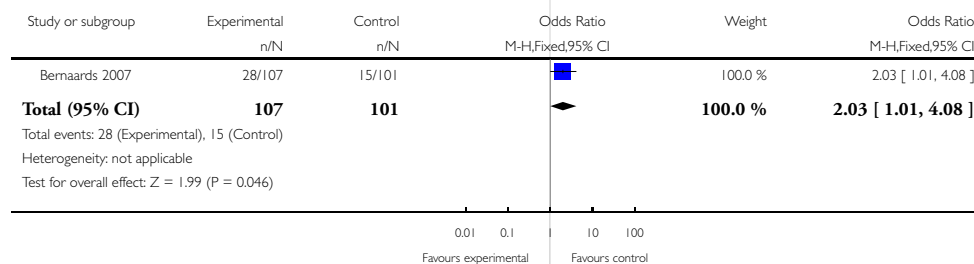


Analysis 3.14. Comparison 3 Two-component (mental education + physical health education, relaxation & breaks) workplace intervention versus no intervention, Outcome 14 Long-term effect: Prevalence 1-2 months without symptoms (Arm: Workstyle+physical activity group).

Review: Workplace interventions for neck pain in workers

Comparison: 3 Two-component (mental education + physical health education, relaxation % breaks) workplace intervention versus no intervention

Outcome: 14 Long-term effect: Prevalence 1-2 months without symptoms (Arm: Workstyle+physical activity group)

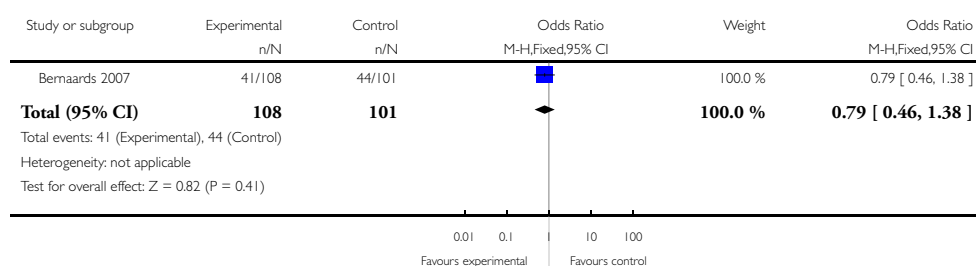


Analysis 3.15. Comparison 3 Two-component (mental education + physical health education, relaxation & breaks) workplace intervention versus no intervention, Outcome 15 Long-term effect: Prevalence 3-6 months without symptoms (Arm: Workstyle group).

Review: Workplace interventions for neck pain in workers

Comparison: 3 Two-component (mental education + physical health education, relaxation % breaks) workplace intervention versus no intervention

Outcome: 15 Long-term effect: Prevalence 3-6 months without symptoms (Arm: Workstyle group)

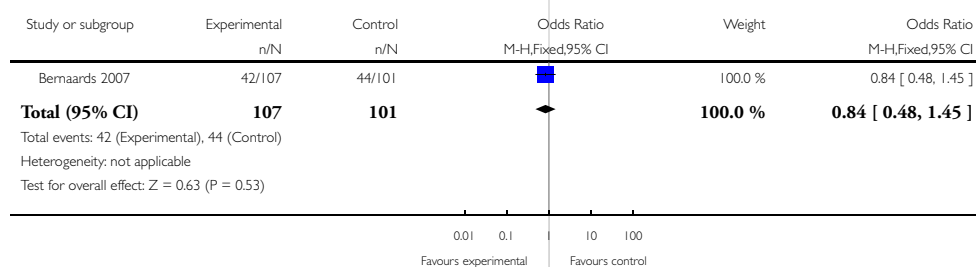


Analysis 3.16. Comparison 3 Two-component (mental education + physical health education, relaxation & breaks) workplace intervention versus no intervention, Outcome 16 Long-term effect: Prevalence 3-6 months without symptoms (Arm: Workstyle+physical activity group).

Review: Workplace interventions for neck pain in workers

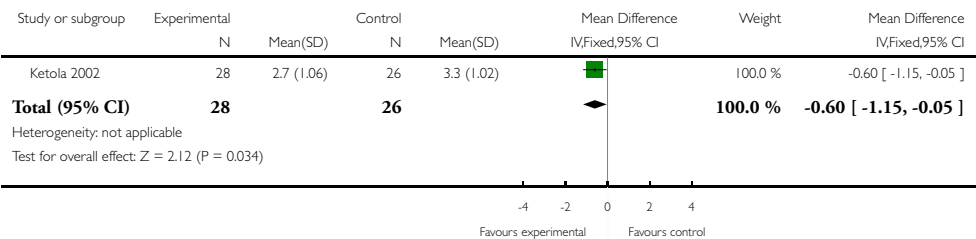
Comparison: 3 Two-component (mental education + physical health education, relaxation % breaks) workplace intervention versus no intervention

Outcome: 16 Long-term effect: Prevalence 3-6 months without symptoms (Arm: Workstyle+physical activity group)



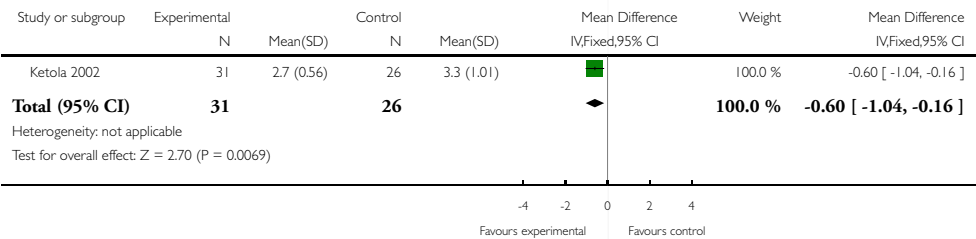
Analysis 4.1. Comparison 4 Two-component workplace intervention (physical health education, relaxation & breaks + physical environment modifications) versus no intervention, Outcome 1 Short-term effect: Musculoskeletal discomfort in the neck (Arm: Intensive ergonomic).

Review: Workplace interventions for neck pain in workers
 Comparison: 4 Two-component workplace intervention (physical health education, relaxation % breaks + physical environment modifications) versus no intervention
 Outcome: 1 Short-term effect: Musculoskeletal discomfort in the neck (Arm: Intensive ergonomic)



Analysis 4.2. Comparison 4 Two-component workplace intervention (physical health education, relaxation & breaks + physical environment modifications) versus no intervention, Outcome 2 Short-term effect: Musculoskeletal discomfort in the neck (Arm: Ergonomic education).

Review: Workplace interventions for neck pain in workers
 Comparison: 4 Two-component workplace intervention (physical health education, relaxation % breaks + physical environment modifications) versus no intervention
 Outcome: 2 Short-term effect: Musculoskeletal discomfort in the neck (Arm: Ergonomic education)

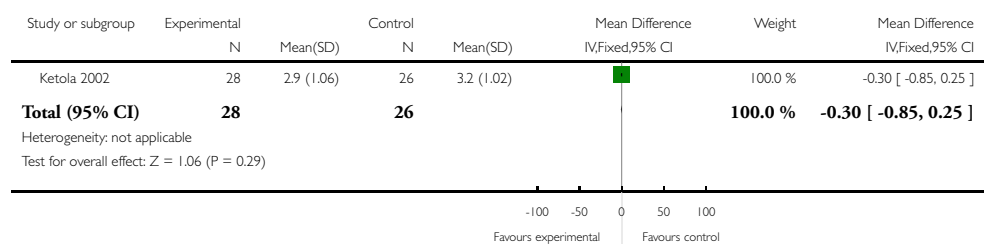


Analysis 4.3. Comparison 4 Two-component workplace intervention (physical health education, relaxation & breaks + physical environment modifications) versus no intervention, Outcome 3 Intermediate-term effect: Musculoskeletal discomfort (Arm: Intensive ergonomics).

Review: Workplace interventions for neck pain in workers

Comparison: 4 Two-component workplace intervention (physical health education, relaxation % breaks + physical environment modifications) versus no intervention

Outcome: 3 Intermediate-term effect: Musculoskeletal discomfort (Arm: Intensive ergonomics)



Analysis 4.4. Comparison 4 Two-component workplace intervention (physical health education, relaxation & breaks + physical environment modifications) versus no intervention, Outcome 4 Intermediate-term effect: Musculoskeletal discomfort (Arm: Ergonomic education).

Review: Workplace interventions for neck pain in workers

Comparison: 4 Two-component workplace intervention (physical health education, relaxation % breaks + physical environment modifications) versus no intervention

Outcome: 4 Intermediate-term effect: Musculoskeletal discomfort (Arm: Ergonomic education)

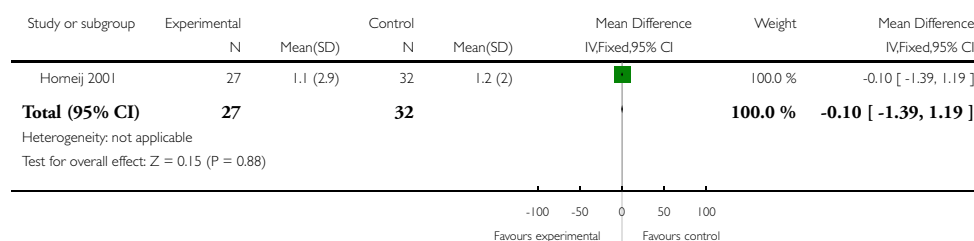


Analysis 5.1. Comparison 5 Mental health education vs. no intervention, Outcome 1 Long-term effect: Change in pain drawing neck/shoulder.

Review: Workplace interventions for neck pain in workers

Comparison: 5 Mental health education vs. no intervention

Outcome: 1 Long-term effect: Change in pain drawing neck/shoulder

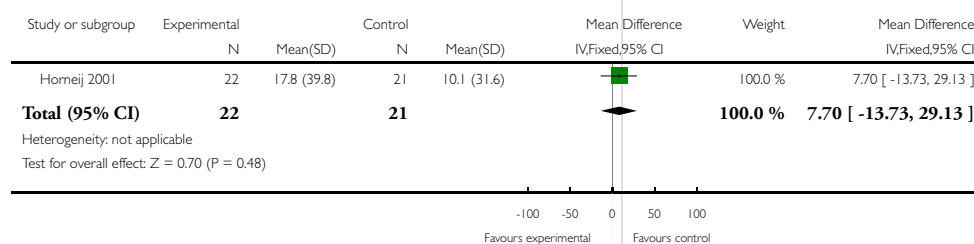


Analysis 5.2. Comparison 5 Mental health education vs. no intervention, Outcome 2 Long-term effect: Change in interference due to neck-shoulder pain last month.

Review: Workplace interventions for neck pain in workers

Comparison: 5 Mental health education vs. no intervention

Outcome: 2 Long-term effect: Change in interference due to neck-shoulder pain last month

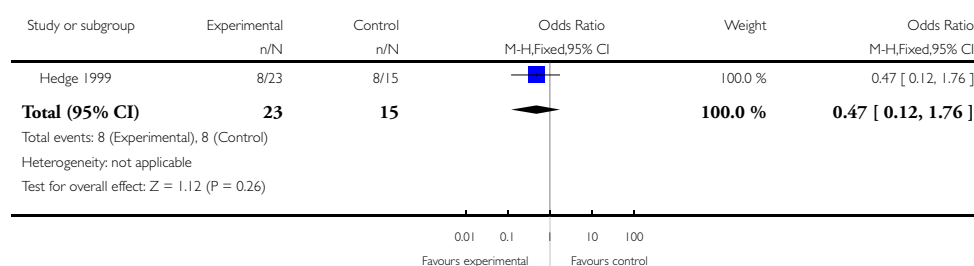


Analysis 6.1. Comparison 6 Physical environment modification versus another physical environment modification, Outcome 1 Short-term effect: Prevalence of neck pain (Downward-tilted vs. flat keyboard in computer work).

Review: Workplace interventions for neck pain in workers

Comparison: 6 Physical environment modification versus another physical environment modification

Outcome: 1 Short-term effect: Prevalence of neck pain (Downward-tilted vs. flat keyboard in computer work)

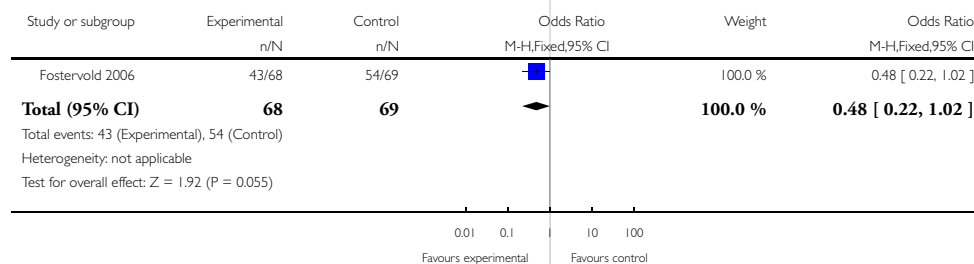


Analysis 6.2. Comparison 6 Physical environment modification versus another physical environment modification, Outcome 2 Long-term effect: Prevalence of discomfort in neck/shoulder (Computer screen angle, high vs. low line-of-sight).

Review: Workplace interventions for neck pain in workers

Comparison: 6 Physical environment modification versus another physical environment modification

Outcome: 2 Long-term effect: Prevalence of discomfort in neck/shoulder (Computer screen angle, high vs. low line-of-sight)



APPENDICES

Appendix 1. CENTRAL Search Strategy

- #1 MeSH descriptor Neck Pain explode all trees
- #2 neck pain
- #3 (#1 OR #2)
- #4 MeSH descriptor Workplace explode all trees
- #5 workplace
- #6 worksite
- #7 MeSH descriptor Sick Leave explode all trees
- #8 sick leave
- #9 (#4 OR #5 OR #6 OR #7 OR #8)

Appendix 2. MEDLINE Search Strategy

- 1 randomized controlled trial.pt.
- 2 controlled clinical trial.pt.
- 3 randomized.ab.
- 4 placebo.ab,ti.
- 5 drug therapy.fs.
- 6 randomly.ab,ti.
- 7 trial.ab,ti.
- 8 groups.ab,ti.
- 9 or/1-8
- 10 (animals not (humans and animals)).sh.
- 11 9 not 10
- 12 neck muscles.sh.
- 13 exp Neck/
- 14 exp neck pain/
- 15 whiplash injuries.sh.
- 16 neck.ti,ab.
- 17 exp Musculoskeletal System/
- 18 musculoskeletal disorder\$.mp.
- 19 or/12-18
- 20 11 and 19
- 21 exp Workplace/
- 22 exp Sick Leave/
- 23 exp Work/
- 24 or/21-23
- 25 24 and 20

Appendix 3. EMBASE Search Strategy

- 1 Clinical Article/
- 2 exp Clinical Study/
- 3 Clinical Trial/
- 4 Controlled Study/
- 5 Randomized Controlled Trial/
- 6 Major Clinical Study/
- 7 Double Blind Procedure/
- 8 Multicenter Study/
- 9 Single Blind Procedure/
- 10 Phase 3 Clinical Trial/

- 11 Phase 4 Clinical Trial/
- 12 crossover procedure/
- 13 placebo/
- 14 or/1-13
- 15 allocat\$.mp.
- 16 assign\$.mp.
- 17 blind\$.mp.
- 18 (clinic\$ adj25 (study or trial)).mp.
- 19 compar\$.mp.
- 20 control\$.mp.
- 21 cross?over.mp.
- 22 factorial\$.mp.
- 23 follow?up.mp.
- 24 placebo\$.mp.
- 25 prospectiv\$.mp.
- 26 random\$.mp.
- 27 ((singl\$ or doubl\$ or trebl\$ or tripl\$) adj25 (blind\$ or mask\$)).mp.
- 28 trial.mp.
- 29 (versus or vs).mp.
- 30 or/15-29
- 31 14 and 30
- 32 human/
- 33 Nonhuman/
- 34 exp ANIMAL/
- 35 Animal Experiment/
- 36 33 or 34 or 35
- 37 32 not 36
- 38 31 not 36
- 39 37 and 38
- 40 38 or 39
- 41 neck muscles.mp.
- 42 exp NECK/
- 43 whiplash injuries.mp.
- 44 neck.mp.
- 45 exp neck pain/
- 46 exp neck muscle/
- 47 musculoskeletal disorder\$.mp.
- 48 or/41-47
- 49 40 and 48
- 50 exp workplace/
- 51 worksite.mp.
- 52 sick leave.mp. or exp medical leave/
- 53 or/50-52
- 54 53 and 49

Appendix 4. CINAHL Search Strategy

S37 S31 and S36
S36 S32 or S33 or S34 or S35
S35 (MH "Sick Leave")
S34 (MH "Work Environment+")
S33 "worksite"
S32 "workplace"
S31 S23 and S30
S30 S24 or S25 or S26 or S27 or S28 or S29
S29 "musculoskeletal disorder*"
S28 (MH "Whiplash Injuries")
S27 (MH "Cervical Vertebrae")
S26 (MH "Neck Pain")
S25 (MH "Neck")
S24 ("neck muscles") or (MH "Neck Muscles+")
S23 S21 not S22
S22 (MH "Animals+")
S21 S20 or S19 or S18 or S17 or S16 or S15 or S14 or S13 or S12 or S11 or S10 or S9 or S8 or S7 or S6 or S5 or S4 or S3 or S2 or S1
S20 "volunteer*"
S19 prospectiv*
S18 "control*"
S17 "follow-up stud*"
S16 (MH "Prospective Studies+")
S15 (MH "Evaluation Research+")
S14 (MH "Comparative Studies")
S13 "latin square"
S12 (MH "Study Design+")
S11 (MH "Random Sample+")
S10 "random*"
S9 "placebo*"
S8 (MH "Placebos")
S7 (MH "Placebo Effect")
S6 "triple-blind"
S5 "single-blind"
S4 "double-blind"
S3 "clinical W8 trial"
S2 "randomized controlled trial*"
S1 (MH "Clinical Trials+")

Appendix 5. PsycInfo Search Strategy

((KW=(Randomized controlled trial*) OR KW=(clinical trial*) OR KW=(clin* near trail*) OR KW=(sing* near blind*) OR KW=(sing* near mask*) OR KW=(doubl* near blind*) OR KW=(doubl* NEAR mask*) OR KW=(trebl* near mask*) OR KW=(trebl* near mask*) OR KW=(tripl* near blind*) OR KW=(tripl* near mask*) OR KW=(placebo*) OR KW=(random*) OR DE=(research design) OR KW=(Latin square) OR KW=(comparative stud*) OR KW=(evaluation stud*) OR KW=(follow up stud*) OR DE=(prospective stud*) OR KW=(control*) OR KW=(prospective*) OR KW=(volunteer*)) AND DE=(neck)) and (KW=(workplace or worksite or (sick leave)))

Appendix 6. ISI Web of Science Search Strategy

23 #22 AND #17
22 #21 OR #20 OR #19 OR #18
21 Topic=(sickness absence)
20 Topic=(sick leave)
19 Topic=(worksite)
18 Topic=(workplace)
17 #16 AND #12
16 #15 OR #14 OR #13
15 Topic=(neck* pain)
14 Topic=(musculosk* disorder*)
13 Topic=(musculosk* syst*)
12 #11 OR #10 OR #9 OR #8 OR #7 OR #6 OR #5 OR #4 OR #3 OR #2 OR #1
11 Topic=(prospective stud*)
10 Topic=(follow up stud*)
9 Topic=(controlled trial)
8 Topic=(comparative stud*)
7 Topic=(research design)
6 Topic=(controlled clinical trial)
5 Topic=(random*)
4 Topic=(placebo*)
3 Topic=(clinical trial*)
2 Topic=(double blind*)
1 Topic=(single blind*)

Appendix 7. OTseeker (Occupational Therapy Systematic review of Evidence)

Keywords: work OR worksite OR workplace

Diagnosis/Subdiscipline: Musculoskeletal or connective tissue injuries/ disorders/ procedures

Method: Clinical Trial

Appendix 8. PEDro (The Physiotherapy Evidence database)

Abstract & Title: work

Body Part: head or neck

Subdiscipline: musculoskeletal

Method: clinical trial

Match all search terms (AND)

Appendix 9. Criteria for risk of bias assessment for RCTs

1. *Was the method of randomisation adequate?* A random (unpredictable) assignment sequence. Examples of adequate methods are coin toss (for studies with two groups), rolling a dice (for studies with two or more groups), drawing of balls of different colours, drawing of ballots with the study group labels from a dark bag, computer-generated random sequence, pre-ordered sealed envelopes, sequentially-ordered vials, telephone call to a central office, and pre-ordered list of treatment assignments

Examples of inadequate methods are: alternation, birth date, social insurance/security number, date in which they are invited to participate in the study, and hospital registration number

2. *Was the treatment allocation concealed?* Assignment generated by an independent person not responsible for determining the eligibility of the patients. This person has no information about the persons included in the trial and has no influence on the assignment sequence or on the decision about eligibility of the patient.

Was knowledge of the allocated interventions adequately prevented during the study?

3. *Was the patient blinded to the intervention?*

This item should be scored “yes” if the index and control groups are indistinguishable for the patients or if the success of blinding was tested among the patients and it was successful.

4. *Was the care provider blinded to the intervention?* This item should be scored “yes” if the index and control groups are indistinguishable for the care providers or if the success of blinding was tested among the care providers and it was successful

5. *Was the outcome assessor blinded to the intervention?* Adequacy of blinding should be assessed for the primary outcomes. This item should be scored “yes” if the success of blinding was tested among the outcome assessors and it was successful or:

- for patient-reported outcomes in which the patient is the outcome assessor (e.g., pain, disability): the blinding procedure is adequate for outcome assessors if participant blinding is scored “yes”
- for outcome criteria assessed during scheduled visit and that supposes a contact between participants and outcome assessors (e.g., clinical examination): the blinding procedure is adequate if patients are blinded, and the treatment or adverse effects of the treatment cannot be noticed during clinical examination
- for outcome criteria that do not suppose a contact with participants (e.g., radiography, magnetic resonance imaging): the blinding procedure is adequate if the treatment or adverse effects of the treatment cannot be noticed when assessing the main outcome
- for outcome criteria that are clinical or therapeutic events that will be determined by the interaction between patients and care providers (e.g., co-interventions, hospitalisation length, treatment failure), in which the care provider is the outcome assessor: the blinding procedure is adequate for outcome assessors if item “4” is scored “yes”
- for outcome criteria that are assessed from data of the medical forms: the blinding procedure is adequate if the treatment or adverse effects of the treatment cannot be noticed on the extracted data

Were incomplete outcome data adequately addressed?

6. *Was the drop-out rate described and acceptable?* The number of participants who were included in the study but did not complete the observation period or were not included in the analysis must be described and reasons given. If the percentage of withdrawals and drop-outs does not exceed 20% for short-term follow-up and 30% for long-term follow-up and does not lead to substantial bias a ‘yes’ is scored. (N.B. these percentages are arbitrary, not supported by literature).

7. *Were all randomised participants analysed in the group to which they were allocated?* All randomised patients are reported/analysed in the group they were allocated to by randomisation for the most important moments of effect measurement (minus missing values) irrespective of non-compliance and co-interventions.

8. *Are reports of the study free of suggestion of selective outcome reporting?* In order to receive a ‘yes’, the review author determines if all the results from all pre-specified outcomes have been adequately reported in the published report of the trial. This information is either obtained by comparing the protocol and the report, or in the absence of the protocol, assessing that the published report includes enough information to make this judgment.

Other sources of potential bias:

9. *Were the groups similar at baseline regarding the most important prognostic indicators?* In order to receive a “yes”, groups have to be similar at baseline regarding demographic factors, duration and severity of complaints, percentage of patients with neurological symptoms, and value of main outcome measure(s).

10. *Were co-interventions avoided or similar?* This item should be scored “yes” if there were no co-interventions or they were similar between the index and control groups.

11. *Was the compliance acceptable in all groups?* The reviewer determines if the compliance with the interventions is acceptable, based on the reported intensity, duration, number and frequency of sessions for both the index intervention and control intervention(s). For example, physiotherapy treatment is usually administered over several sessions; therefore it is necessary to assess how many sessions each patient attended. For single-session interventions (for ex: surgery), this item is irrelevant.

12. *Was the timing of the outcome assessment similar in all groups?* Timing of outcome assessment should be identical for all intervention groups and for all important outcome assessments.

Appendix 10. Questions to determine clinical relevance

1. Are the patients described in detail so that you can decide whether they are comparable to those that you see in your practice?
2. Are the interventions and treatment settings described well enough so that you can provide the same for your patients?
3. Were all clinically relevant outcomes measured and reported?
4. Is the size of the effect clinically important?
5. Are the likely treatment benefits worth the potential harms?

HISTORY

Protocol first published: Issue 4, 2009

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CONTRIBUTIONS OF AUTHORS

The lead review author (RWA) initiated and planned the review, and administrated the review process.

One review author (RWA) planned the search strategy and two review authors (RWA and KAH) undertook the search the first time. Updated searches were done by the Cochrane Back Review Group's Trials Search Co-ordinator, Rachel Couban.

Two review authors, and two assistant scientists participated in the decision-making process regarding inclusion and exclusion of trials (RWA, KAH, BHS, KLE).

One author developed the inclusion/exclusion- and quality assessment standardised forms (RWA). Eight review authors participated in the data extraction and assessment of risk of bias of the ten included studies, constituting four reading couples (SM+RWA), (AM+KAH), (HT+CR) and (TL+ML). One author performed quality assurance of the risk of bias assessment of the included studies, and collected missing information from the trials' first author (HT). One review author did a qualitative content analysis, to identify the interventions in the studies, and sorted these results according to the ICF (RWA). One review author collected the result data from the authors of the included studies (TL). Another author conducted all the analyses of treatment effects, in line with the ICF-classification of the interventions (RWA). Two authors conducted the GRADE analysis (RWA, HT).

The lead review author (RWA) wrote drafts of the review and sent them to all co-authors and to our mentor, Andrew Oxman and advisor, Jos Verbeek for comment and input.

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None known.

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